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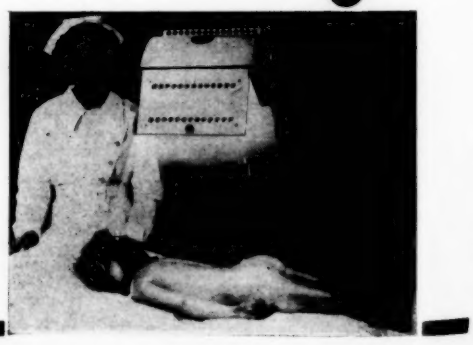

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EFFECT OF NATURAL CARBONATED BATHS ON RATE AND AMPLITUDE OF PULSE AND BLOOD PRESSURE *

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and

WALTER S. McCLELLAN, M.D.

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The evaluation of any therapeutic procedure must finally depend on whether or not the patient obtains relief for his ailment. Until recently mineral waters of all types have been prescribed on an empirical basis. In a few places objective studies by physiologic methods are in progress.

Saline-alkaline waters which are supersaturated with carbon dioxide have been shown by Groedel and his collaborators[1] and Mougeot and his coworkers[2] to exert a definite influence on the circulation, on respiration and on elimination. McClellan, Joslin and Maguire[3] found that the pulse rate usually fell after a bath in the naturally carbonated water at the Saratoga Spa while the response in the change of blood pressure was variable.

All observers agree that there is a greater amount of blood in the skin areas after a bath of this type. The question arises as to what mechanisms are affected. Is it due entirely to dilatation and an increase in the number of capillaries? Is there a definite dilatation of the arterial tree? Capillary studies[4] have answered the first question in the affirmative. The studies here presented give some evidence in support of the second question.

Clinical Material and Methods

The studies were carried out with ambulatory patients who were taking a course of treatments at the Saratoga Spa. There were 44 patients in the series about equally divided between men and women and nearly all above 40 years of age. In this group were 16 with hypertension, i. e., with systolic pressures above 150 mm. Hg., 14 with severe arteriosclerosis, 6 with organic disease of the central nervous system, 3 with chronic rheumatic heart disease, 3 with chronic arthritis and 2 normal individuals.

The pulse was counted at the beginning of each observation. The amplitude of the pulse wave and the blood pressures were taken from tracings made with the Tycos recording sphygmomanometer. In each observation three tracings were taken, first, with the pressure cuff on the upper arm, second, with the cuff on the forearm just above the wrist and, third, with the cuff on the lower leg just above the ankle. Tracings were taken with the cuff on the thigh but they were not satisfactory for comparison and were not made a part of this study. The tracings were made with the patient lying on a table and the arm and leg elevated to the level of the right auricle (fig. 1).

The following procedure for each pair of observations was uniform. The patient came to the bath house in the morning, undressed and lay on an examining table for approximately 15 minutes or until his pulse rate reached a constant level in two successive readings. Next the observer made the three tracings outlined above. Then the patient walked to the bathing cubicle which was adjacent to the examining room and took the bath prescribed for him. After the bath the patient was dried off with a warm sheet without friction and returned to the examining table where a second set of tracings was recorded.

* From the Medical Department of The Saratoga Spa, Saratoga Springs, New York.

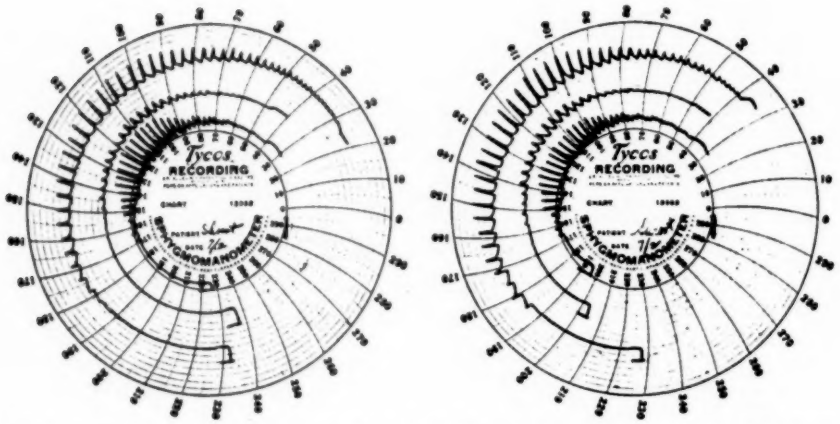

Fig. 1. — Tycos records made before the bath (left) and after the bath (right). The inner tracing was recorded with the pressure cuff on the upper arm, the middle tracing with the cuff on the forearm and the outer tracing with the cuff on the lower leg.

The water used for bathing was from the Lincoln Springs and contained approximately 8.0 grams of minerals per liter. At the temperature used for bathing between 90 and 98 F. the supersaturation of the carbon dioxide averaged 32 volumes per cent. The variation in temperatures was entirely between patients as the same temperature was used when the observations were repeated on the same patient. The duration of the bath usually was 15 minutes, but in a few cases only 8 or 10 minutes.

For most patients observations were made at the beginning of the course of treatment and at the end of 10 baths. A few patients had a third set of tracings taken at the end of their course and a few had only one set. All observations were made by the same person.

Experimental Data

The data presented here were compiled from 90 pairs of tracings made on the 44 patients studied and were obtained by a comparison of the tracings taken before the bath with those made after the bath. No comparisons were made between tracings taken at the beginning of treatments with those made at the end of the course as insufficient data were available for such a study.

Pulse Rate. — In 77 of the 90 pairs of observations there was a decrease in the pulse rate which varied from 1 to 40 beats per minute and averaged 8 per minute. In 12 there was no change in rate and only one patient showed any increase. This occurred in a man with spastic hemiplegia who had great difficulty in walking the short distance from the bath to the examining room. The exertion was sufficient to cause pronounced dyspnea, which undoubtedly accounted for his increased rate. Table 1 presents a summary of these data.

Pulse Wave Amplitude. — The amplitude of the pulse wave was determined by the height of the deflection in the tracing from the base line. The record paper is marked with circular lines spaced at intervals of approximately 2.5 mm. For convenience, the space between two lines is called one degree. Of the 90 pairs of tracings from the upper arm, 49 showed an increase of amplitude after the bath, 36 a decrease and 5 no change. Both the average increase and the average decrease were 1.4 degrees of the Tycos scale. In an equal number of tracings from the forearm where the vessels of the arterial tree are smaller 49 showed an increase, 32 a decrease and 9 no change. Again the average variation of both increase and decrease was 0.8 degrees. There were 89 pairs of tracings from the lower leg in which 36 showed an increase, 33 a

TABLE 1. — *Comparison of Pulse Rates Recorded Before and After the Bath.*

	Number of Obervations	Per Cent	Range of Variation	Average Change
Observations Showing:				
Decrease	1	1	12	12.0
Increase	77	86	1-40	8.2
No change	12	13	....	.....
Total	90	100	....	.....

decrease and 20 no change. The average increase was 0.9 degrees and the decrease 1.1 degrees. Table 2 gives a summary of these data.

To study the changes in amplitude in the vessels which were constricted either by spasm or narrowing, or by both, we made an analysis of those tracings from the forearm and lower leg, where the amplitude was two degrees or less before the bath. Of 43 such tracings from the forearm, 31 showed an

TABLE 2. — *Comparison of the Pulse Wave Amplitude Observed Before and After the Bath.*

	Number of Observatins	Per Cent	Average Change in Degrees
Upper Arm —			
Observations Showing:			
Increase	49	54	1.4
Decrease	36	40	1.4
No Change	5	6	....
Total	90	100	....
Forearm —			
Observations Showing:			
Increase	49	54	0.8
Decrease	32	36	0.8
No Change	9	10	....
Total	90	100	....
Lower Leg —			
Observations Showing:			
Increase	36	40	0.9
Decrease	33	37	1.1
No Change	20	23	....
Total	89	100	....

increase in amplitude after the bath averaging 0.8 degrees, 7 showed a decrease averaging 0.3 degrees and 5 presented no change. In the lower leg of 27 sets taken, 11 showed an increase of 0.6 degrees, 2 revealed a decrease of 0.5 degrees and 14 showed no change. Table 3 summarizes these data.

Blood Pressure. — Table 4 shows the data for changes in the systolic, the diastolic and the pulse pressures.

It is seen that there is no significant variation in the pressure readings as the number which showed an increase in each division is approximately the same as the number which showed a decrease. The data are presented both for those records showing any change and also for those showing a change of 5 mm. Hg. or more. A change of less than 5 mm. Hg. was not considered significant.

TABLE 3. — *Comparison of Pulse Wave Amplitudes of Two Degrees or Less Before the Bath With Those After the Bath.*

	Number of Observations	Per Cent	Average Change in Degrees
Forearm —			
Observations Showing:			
Increase	31	72	0.8
Decrease	7	16	0.3
No change	5	12	....
Total	43	100	....
Lower Leg —			
Observations Showing:			
Increase	11	41	0.6
Decrease	2	7	0.5
No change	14	52	....
Total	27	100	....

In 90 pairs of tracings taken on the upper arm, 34 revealed a significant rise of 5 mm. Hg. or more with an average change in the systolic pressure of 14.1 mm., 22 had an average fall of 15.0 mm. and 34 showed no significant change. In the forearm, of 82 pairs of tracings, 25 revealed an average increase of 11.7 mm., 28 an average decrease of 12.9 mm. and 29 no change. For 80 pairs taken on the lower leg, 39 gave an increase averaging 13.1 mm., 23 a decrease averaging 15.1 mm. and 18 no change. It was found that the systolic pressure tended to rise slightly more frequently in the upper arm and lower leg while in the forearm it fell slightly more frequently after the bath.

When comparisons for the diastolic pressures were made, the number of tracings revealing an increase or decrease of 5 mm. or more was equal for the upper arm and the forearm. In the lower leg 28 showed an average increase of 12.7 mm., 13 a decrease averaging 9.5 mm. and 39 no significant change. The tendency to show an increase in pressure was more frequent in tracings taken from the lower leg. This tendency was also evident in the systolic pressure readings.

The changes noted in the pulse pressure occurred essentially in the same number showing increases and decreases as were noted for the changes in systolic pressures. As in systolic pressure, the tendency to increase was slightly more evident in tracings taken from the upper arm and the lower leg.

To determine whether the changes were influenced by the initial level of blood pressure a study was made of the tracings where the initial systolic pressure was over 150 mm. Hg. The data obtained are presented in table 5, the analysis being limited to tracings from the upper arm.

From these data the changes noted revealed no significant difference from those presented in table 4 for the entire series.

Discussion

Pulse Rate. — The changes in the pulse rate observed in these studies are the same as reported by practically all observers of the influence of the carbonated bath on circulation. Almost uniformly the pulse rate is slowed. As was found here, in earlier studies,[3] the pulse rates of many patients were normal at the beginning of the observations so the decrease noted was relatively slight. In patients with mild or moderate tachycardia the decrease was greater. In one patient, a decrease of 40 beats per minute was noted.

TABLE 4. — *Comparison of Blood Pressures Observed Before and After the Bath.*

	Systolic Pressure			Diastolic Pressure			Pulse Pressure		
	No. of Observations	Per Cent	Average Change in mm.	No. of Observations	Per Cent	Average Change in mm.	No. of Observations	Per Cent	Average Change in mm.
Upper Arm —									
Observations Showing:									
Increase	50	56	6.5	42	47	6.2	50	56	10.0
Decrease	35	39	10.5	42	47	7.3	31	35	10.3
No Change	5	5	.....	5	6	.....	8	9	.....
Total	90	100	.....	89	100	.....	89	100	.....
Increase of 5 mm. or more	34	38	14.1	21	24	10.1	34	38	13.4
Decrease of 5 mm. or more	22	24	15.0	21	24	12.6	21	24	13.8
Forearm —									
Observations Showing:									
Increase	42	51	8.0	38	47	6.0	40	49	8.4
Decrease	36	44	10.6	35	43	7.6	39	48	9.4
No Change	4	5	.....	8	10	....	2	3	.....
Total	82	100	.....	81	100	....	81	100	.....
Increase of 5 mm. or more	2	31	11.7	24	30	8.2	26	32	.....
Decrease of 5 mm. or more	28	34	12.9	24	30	10.0	27	33	.....
Lower Leg —									
Observations Showing:									
Increase	47	59	11.4	44	55	8.1	45	56	8.7
Decrease	33	41	11.2	29	36	5.6	34	43	12.5
No Change	0	0	.....	7	9	....	1	1	.....
Total	80	100	.....	80	100	....	80	100	.....
Increase of 5 mm. or more	39	49	13.1	28	35	12.7	32	40	.....
Decrease of 5 mm. or more	23	29	15.1	13	16	9.5	24	30	.....

TABLE 5. — *Comparison of Blood Pressures Observed in Upper Arm Before and After the Bath When Initial Systolic Pressure Was Over 150 mm. Hg.*

	Sytolic Pressure			Diastolic Pressure		
	No. of Observations	Per Cent	Average Change in mm.	No. of Observations	Per Cent	Average Change in mm.
Observations Showing:						
Increase	25	58	12.4	22	51	6.8
Decrease	16	37	13.6	19	44	9.9
No change	2	5	.....	2	5	.....
Total	43	100	.....	43	100	.....
Observations Showing:						
Increase of 5 mm. or more	18	42	16.1	12	28	10.4
Decrease of 5 mm. or more	12	28	18.0	11	26	15.1

The decrease in the pulse rate has been attributed to rest associated with taking the bath. This is not considered sufficient to explain the change since the patients rested before the bath until the pulse rate was essentially constant. Many observers consider that the reduction in rate is due to an increased vagal influence on the heart. Unless some influence of a central nature were acting,

the peripheral increase of blood would normally lead to an increase in rate, such as is noted in plain, warm baths. Benson[5] has studied the increase in heart rate as influenced by the temperature of the skin and has shown that skin temperature increases produced by hot air or warm baths result in an increased heart rate.

It appears most likely that the reduction in rate is due to cardio-inhibitory impulses produced by the influence of the carbon dioxide which is absorbed through the skin during the bath in naturally carbonated mineral water.

Pulse Amplitude. — There is a recognized hyperemia following the carbonated bath, and Fischer[4] has shown by microscopic studies that there is an increase in the number of functioning capillaries and in their diameter. Is there also a definite dilatation of the small arteries and arterioles or the arterial tree? The observations in this study were made to determine if there could be obtained definite evidence on this question. Beck and de Takáts[6] have shown that the Tycos recording sphygmomanometer reveals changes in height of the spike which indicate the peripheral vascular capacity. They found, after giving sodium nitrite intravenously, an increase in the height of the oscillation spike and a shift of the maximum elevation to lower pressure levels. They demonstrated that this apparatus will show changes indicating the amplitude of the pulse wave.

In the studies here presented there was a definite tendency toward increase in amplitude which was more evident in the upper extremity and showed greater resistance to change in the lower leg. This variation in response was more striking when comparisons were made in changes of amplitude in the forearm and the lower leg of patients with amplitudes of 2 degrees or less. Here again the changes in the forearm were definite as 72 per cent of the observations showed positive increase of amplitude, while in the lower leg 41 per cent showed an increase.

It is evident that the response to the bath is more frequently noted if there is an initial constriction in the arterial tree. This constriction may be due either to organic changes in the vessels or to muscular spasm, or both. It is not considered possible that vessels occluded by organic changes will show dilatation, so that the changes noted were more likely due to increase in muscular spasm. It would appear then that muscular spasm is a greater factor in causing constriction in the upper than in the lower extremity.

Blood Pressure. — Reports of the influence of the baths on blood pressure have varied. In a previous report[3] 52 per cent of the patients with pressure above 150 mm. of Hg. showed a decrease of 10 mm. or more, while only 11 per cent showed an increase of this amount. Groedel and McClellan,[7] using a continuous recording blood pressure apparatus showed in normal individuals an increase in pulse pressure during the bath which resulted from a slight rise in systolic pressure and a fall in diastolic pressure.

In the present studies the changes found in the pressure readings were not striking. Individual patients did show some striking responses with decrease in blood pressure. It is not possible to state any general rule regarding the response of patients with hypertension to the carbonated mineral baths. In many, definite reduction will occur, while in others no change will result. A consideration of the general aspects of the influence of the baths on the circulation has recently been presented by one of us[8] to which the reader is referred.

The systolic blood pressure in the lower leg was found by this method to be somewhat higher than in the upper extremity and the changes in an upward direction were more frequent in the lower leg. This fact may be correlated with the lowered frequency of increase in amplitude in the lower leg. With the slowing of the pulse rate and resultant increased systolic output per beat, the greater vasodilatation in the upper arm tended to overcome the sequential in-

crease in blood pressure, while in the lower leg the lesser increase in amplitude failed to accommodate the greater blood volume, and the blood pressure here tended to increase more frequently. This would also indicate that organic changes are more frequently a factor in vaso-constriction in the leg than is muscular spasm.

The observations presented in this report must be carried further before a final conclusion is possible, but they support the opinion that the carbon dioxide bath tends to produce some dilatation of the smaller vessels of the arterial tree as one of its physiologic effects.

Summary and Conclusions

1. Observations of the pulse rate, pulse amplitude and blood pressure on 44 patients were made with the Tycos recording sphygmomanometer and 90 pairs of tracings were made before and after the natural carbon dioxide mineral water bath.

2. In 86 per cent of the observations there was a decrease in pulse rate which is the typical response to these baths.

3. The amplitude of the oscillations increased more frequently than it fell and this was more evident when arterial constriction was present, resulting in low amplitude of the oscillation. Also, the increase was more evident in the arm than in the leg.

4. The changes noted in systolic, diastolic and pulse pressures were not striking as the number showing increases were nearly the same as that which manifested decreases.

5. The amplitude of oscillations gives some evidence that the carbon dioxide bath, in addition to producing a peripheral capillary hyperemia, results in some dilatation of the smaller vessels of the arterial system.

References

1. Groedel, F. M., and Wachter, R.: Experimentelle Studien über die physiologische der kohlensauren Kochsalzthermen, Ztschr. f. wissensch. Bäderk. **2**:873 (July) 1928.

2. Mougeot, A.; Petit, P., and Aukertot, V.: La Cure Balnéaire de Royat, 2nd revised Ed., Clermont-Ferrand, France, Jean de Bussac, 1936.

3. McClellan, W. S.; Joslin, E. F., and Maguire, G. V.: The Influence of Natural Carbonated Mineral Water Baths on Blood Pressure and Pulse Rates, New York State J. Med. **34**:101 (Feb. 1) 1934.

4. Fischer, L.: Über allgemeine und örtliche Veränderungen am Capillarsystem, Klin. Wchnschr. **10**:1337 (July 18) 1931.

5. Benson, Simon: Observations on the Cardio-accelerator Reflex from Stimulation of Skin Temperature Receptors, Am. Heart J. **15**:45 (Jan.) 1938.

6. Beck, W. C., and de Takáts, G.: The Use of Sodium Nitrite for Testing Flexibility of the Peripheral Vascular Bed, Am. Heart J. **15**:158 (Feb.) 1938.

7. Groedel, F. M., and McClellan, W. S.: Fortlaufende Blutdruckkontrolle während des Bades, Ztschr. f. d. ges. phys. Therap. **44**:211, 1933.

8. McClellan, W. S.: The Place of Carbon Dioxide Baths in the Treatment of Diseases of the Circulation, Internat. Clin. **1**:199 (March) 1937.

Discussion

Dr. A. B. Olsen (Battle Creek, Mich.): Careful study and research of the physiologic effects on the human body of various hydriatic procedures are always welcome and we are indebted to the essayists for their interesting presentation. The reports of such studies should be helpful to the practicing physician in giving definite and precise directions when prescribing treatment in order to obtain the benefit desired. The use of water at different temperatures and under various conditions undoubtedly has definite effects upon the body and its organs and especially upon the heart, circulation and respiration. It is also true that the effects of the treatment prescribed are greatly modified and influenced by the condition of the patient at the time of treatment.

The results reported on the use of tepid or neutral carbonated baths are in agreement with those of the Schott brothers of Nauheim, Germany. They were pioneers in the use of natural carbon dioxide thermosaline baths at a temperature of 86 to 94 F.

They, too, noted a slowing of the heart beat and increased amplitude of the pulse which they attributed to vasodilator action of the nerves.

Curran Pope also has called attention to the slow but stronger pulse with increased amplitude from the use of neutral or tepid carbonated baths.

In the eighties and nineties of the last century J. H. Kellogg experimented with tepid or neutral baths with a temperature of 90 to 97 F. and noted lowering of the pulse, details of which he gave in his book, "Rational Hydrotherapy." It is an everyday experience at the sanitarium that these tepid or neutral reclining plain water baths not only slow the pulse a few beats but at the same time also increase its vigor. On the other hand warm baths increase the pulse rate, a fact with which we are all familiar.

The question might be asked, How much added effect upon the pulse, if any, is obtained by using carbonated instead of plain water at the same temperature? We are reminded of a monograph by the late Dr. Woods Hutchinson of New York written some thirty-five years ago. He called attention to the many hundreds of mineral spas both in this country and elsewhere and he studied the differences of the chemical constituents of their waters and also the similarity of the claims made on behalf of each. He said he was looking for the common ingredient or quality that accomplished the results claimed but found none except "wetness" as he whimsically expressed it. He concluded that it was the skilful and controlled regulation of the baths that accounts for the benefit obtained, rather than the presence of various minerals in varying quantity.

It is not idle to say that health hostels without natural mineral waters enjoy equal success in treating the numerous and varied chronic ailments to which man is heir.

A series of carbonated mineral water baths given as described by the authors and paralleled by a control series of plain water baths given in the same way and to the same class of patients should determine this question.

Dr. Fred B. Moor (Los Angeles): The authors of this paper have undertaken a meritorious study of the circulatory effects of the external application of carbonated mineral water at neutral temperatures. Fundamental studies of the physiologic action of physical agents are the great need of physical therapy today. This is the basis for a rational clinical approach.

The authors' findings on the effects of carbonated mineral baths correspond well to the effects of the Nauheim bath, which also utilize carbonated mineral water. The redness of the skin and the peripheral circulatory stimulation in these baths is caused, not by heat, but by carbon dioxide and mineral elements. These are said to stimulate reflexly the so-called "peripheral heart," the rhythmic tonus waves from the vasomotor center. This, of course, takes some of the load off the heart. That this is not a simple peripheral dilatation, such as is produced by heat, is borne out by the fact that the blood pressure changes are minimal.

It is more difficult to evaluate the increase in the amplitude of oscillation. Changes in oscillation are likely to be associated with changes in blood pressure as shown by the radial sphygmogram. Decrease in the pulse again is evidence that this is not a simple dilatation of the heat type. My impression is that the redness of the skin observed in these carbonated baths is due more to superficial capillary rather than to deeper arteriolar dilatation.

I would like to suggest to the authors that as they continue this good work, they study more normal individuals to establish a physiologic base line for the pathologic cases. I shall be greatly interested to follow further progress of this study.

SPA THERAPY IN RHEUMATIC DISEASES *

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and

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It is unfortunate that we do not have in the United States an official medical definition of the word "spa," but our concept of it is similar to that adopted by the British Spa Federation in 1939, which is:

1. The possession of natural mineral waters which possess a definite therapeutic value;
2. The existence of sufficient bathing and pump room accommodation;
3. The residence in the particular town of medical men who specialize in spa treatment;
4. Suitable hotel and boarding-house accommodation;
5. Treatment must be given under the directions of properly qualified medical men;
6. The amenities and sanitary conditions of the town must be duly approved by the Federation;
7. The spa must be under municipal or other approved control; and
8. The chief activity of the spa must be the provision of facilities for spa treatment.

In addition, we feel that various climatic conditions have a definite bearing on the benefits of spa therapy, especially when it is applied to the treatment of rheumatic disease. Although hydrotherapy is the backbone of spa therapy, these components must be taken into consideration for the management of rheumatic disease.

The one distinct advance that has been made in the treatment of rheumatic disease has been physical therapy, and it is now recognized as a valuable adjunct. The drinking of water and the application of the various agents such as tub baths, vapor baths, sitz baths, various body douches, hot packs, and exercise pools are of distinct value. The use of water offers certain mechanical advantages which enable us to combine other physical procedures, such as massage and exercise so that the greatest amount of physiologic response may be obtained with the least amount of effort to the patient and to the operator. These beneficial results may be summed up as increased elimination, stimulation of the vasomotor mechanism, a stepping-up of the metabolism of the body, acceleration of the rate of blood flow through the peripheral vessels, and an increase in tissue immunity.

With these basic principles of hydrotherapy well in mind, we now come to one of the most intense controversies in hydrotherapy. Do natural thermal or mineral waters have any advantage over each other? Do natural thermal or mineral waters have any advantage over tap water? Can natural thermal or mineral waters be duplicated by artificial means? There are adherents to both points of view, and in a great many instances it is evident that the opinions are partisan rather than scientific. Unfortunately, much of the experimental work carried on in Europe was in a spirit of optimism and not well enough controlled to be of much value. Very little experimental work has been done in the United States, but a start has been made at Saratoga Springs, and we wish to commend the Saratoga Commission upon the work it has done in developing this branch of medicine.

* Read at the Eighteenth Annual Session of the American Congress of Pyhsical Therapy, New York City, September 6, 1939.

Hot Springs Spa

The Hot Springs National Park (Arkansas) Spa offers many advantages to patients suffering from rheumatic disease. Hot Springs is easily accessible and has a moderate year-around climate. Excellent facilities are available for the accommodation of vistors, and its medical, hospital, and bathing facilities are adequate. The thermal waters come from forty-seven springs flowing approximately 1,000,000 gallons per day. The temperature of the waters ranges from 148 F. to 122F. with an average temperature well above 140 F. The water is collected in a central distributing reservoir, where it is piped to the various bath houses and hotels, which are equipped with the necessary mechanical devices for the various types of baths. The rules governing sanitation, bathing, and medical practice are made and enforced by the National Park Service. The baths are administered according to the directions of a physician, who gives the patient a prescription for the type of bath desired, which the patient delivers to the bath house manager. The patient has free choice of physician and bath house, and there is no commercial connection between the physicians, hotels, or bath houses. Government analysis of the water shows it to be comparatively high in mineral content and mildly radio-active. Our opinion as to the superiority of this over other waters is based upon clinical observation of a large number of rheumatic patients rather than upon physiologic research. Our clinical experience has shown us that we may obtain a wide range of physiologic responses of the body, thermal in nature, without excessive stimulation of the central nervous system, and subject to minute control. The degree of the response depends upon the length of time in the bath, and the temperature of the water. Clinical observation shows that we are able to obtain a thermal response from this water at a temperature of 97 F. to 98 F. within fifteen minutes of immersion. At this temperature and time, there is a marked peripheral dilatation with a consequent fall in blood pressure and an increase in the heart and respiratory rates. This effect is accentuated by increasing the time as well as the temperature of the baths to 103 F. and 104 F. which may be given without excessive stimulation of the central nervous system. The use of body douches and vapor baths may greatly enhance the thermal response of the body to the tub bath. The application of hot packs to affected joints enhances the beneficial results. Packs as hot as 120 F. can be tolerated for varying periods without blistering the skin. By increasing the time in the tub and vapor baths, a definite rise in body temperature may be obtained. In addition, oxidation within the individual cells is increased, which aids in eliminating waste material through the skin, lungs, and kidneys. The ability to control these responses is particularly applicable to the treatment of rheumatic cases, in that a program can be fitted to individual needs, and even the most debilitated patients can be given baths. Another reason for our water possessing advantages over others is that even at comparatively low temperatures these systemic effects are extended and last as long as four hours after the bath. In the treatment of gouty arthritis, there is a distinct rise in the blood uric acid after the second or third bath. This rise continues through the thirteenth or fourteenth bath before it starts to fall; and usually returns to normal by the eighteenth or nineteenth bath.

Secondary Advantages

In addition to the beneficial results obtained by hydrotherapy, the rheumatic patient is offered certain advantages of a psychotherapeutic nature. The relief of pain, change of environment, the increased use of the body

which early is apparent in spa treatment, and particularly the exercise obtained in the thermal pools are factors which bring about a marked change in the psychology of the patient. Hope is renewed, and the will to get well is revived. The patient sees other cripples worse off than himself, he compares his experiences with those of others, and many times individuals who had resigned themselves to a life of invalidism obtain a cure.

There are certain other factors pertinent to the treatment of rheumatic diseases which must be considered in evaluating spa therapy. We know that there is no specific cure. The care provided in conventional hospitals is inadequate. The treatment is a system of management, and each procedure is one of a series of incidents. No two cases of arthritis are alike, and an effective program must be organized to fit individual needs, and should be flexible enough to apply to the many phases of the disease. We offer spa therapy not as a specific remedy or cure, but as a therapy which can be adapted to all individual needs. There can be concentrated in a period of three to six weeks procedures which not only have a beneficial physiologic effect but also a beneficial psychologic effect. These procedures are balanced with exercise and rest and may interrupt the vicious cycle of rheumatic disease and give the needed impetus and stimulation to enable the family physician to effect a cure.

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Discussion

Dr. Charles I. Singer (Long Beach, N. Y.): During a survey of the vacational migration habits of the American public, I was informed that in Hot Springs, Arkansas, about 185,000 patients received more than 850,000 treatments during the last year. This is a very large number. It is a compliment to the spa, and also an honor which carries tremendous responsibilities.

The definition of the future American spa has not yet been found, but I feel that it will have threefold responsibilities — first of therapy, second of research, and third of teaching. The definition of the British Spa Federation fully covers the first responsibility of the spa, the responsibility to the patient as a treating center, but just as certainly omits the other two, those of research and teaching. While therapy is the flesh and blood of every spa, research should be the soul and teaching should be the heart. To delve into the details of the biologic effect of the spa regime and to provide the general practitioner with facts which survived the acid test of modern biologic research should be the future program of any progressive American health resort. No spa needs advertisement, if the more than 150,000 general practitioners are convinced that its regime is scientific and helpful.

These facts uncovered by research will mostly be appreciated by the general practitioner in rheumatic diseases. These diseases so far have no specific cures, and the success or failure of their therapy so often hinges on the important factor whether the patient is reconciled to taking a long-range view of his disease and is willing to follow a long-range program of therapy, such as is carried out in tuberculosis or syphilis. In this long-range-view therapy of rheumatic diseases, spas have a definite and important place. As Dr. Smith and Dr. Lutterloh put it, it will function in interrupting the vicious circles which maintain the disease, in giving an impetus to the system in fighting it, in preparing the soil for the family physician to complete it after the course in harmony and co-operation with the spa.

I had the pleasure of co-operating with Hot Springs, Arkansas, last year, sending them several patients and getting reports about the progress made in the spa, and I enjoyed that co-operation.

Dr. John Carroll (New York): I concur wholly with the emphasis the essayists place upon physical therapy in rheumatic disease, and with their appraised value of the contributing components of a well-organized spa. I am one of those who believe that natural thermal and mineral waters have an advantage over tap water, that there is in certain waters a definite value in particular diseases, and that artificial means can approach but not duplicate natural and thermal mineral waters. These beliefs do not, however, allow me to rest in comfort and to preach the gospel of spas until experiment and research establish confirmatory data on the matter. Investigation has been sorely needed in this field, and we are thankful that it has been begun. I heartily support the authors in their commendation of the Saratoga Commission for the work they have done. I believe the American commonwealth is greatly in need of spa facilities, and the co-operation of the profession should be given to supply this need.

Dr. Richard Kovács (New York): In the past two years I have had the pleasure of visiting Hot Springs, Arkansas, twice and was most favorably impressed by the fact

(Concluded on page 170)

PHYSICAL TREATMENT OF ARTHRITIS *

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When one considers any form of treatment of the arthritides, it is essential first to establish an accurate diagnosis. For this the physician should have in mind a workable classification of the various forms of arthritis. Since inflammation of joints manifests itself in many forms and the nomenclature is extremely complicated, no classification which is universally acceptable has been developed. At our clinic the following abridged classification has proved acceptable as a basis for general diagnosis and treatment:

Traumatic Arthritis. — That caused by trauma.

Infectious Arthritis. — That caused by infections of known type (identifiable bacteria) and that possibly or probably caused by infections (unidentifiable or related toxins).

Degenerative Arthritis. — That caused or characterized by degenerative tissue changes.

Chemical Arthritis. — That whose chief (or only) obvious characteristic is a recognizable (or suspected) chemical derangement.

Neoplastic Arthritis. — That due to neoplasms, malignant or benign.

Miscellaneous. — Miscellaneous and unclassifiable types.

Once the diagnosis has been established and the case properly classified, the physician may proceed to apply treatment in an intelligent manner. It is obvious that proper management of the arthritides requires careful diversification of therapeutic measures. While physical treatment plays an extremely important part in the control of many types of arthritis, it should never be used to the exclusion of other procedures. The therapeutist should develop a program which may include psychotherapy, rest, elimination of trauma, physical therapy including fever and roentgen therapy, dietetic management, supports, surgical removal of foci or other surgical measures, administration of vaccines, administration of analgesics and other drugs, climatotherapy and institutional care.

While I desire to stress the importance of physical measures in the management of various forms of arthritis, I also wish to point out that such procedures can be used successfully only when they are made part of a well-planned general treatment program. Many authorities have stressed the value of physical therapy in the management of joint lesions. Thus, Fox and Van Breemen[1] said with regard to their treatment of rheumatic diseases " . . . . . we rely to a great extent on Physical Medicine." Copeman[2] stated, "One of the most important therapeutic advances made in this century is the discovery that the human body can be influenced as much from the outside by what are known as 'Physical' Methods, as it can from the inside by 'Medicinal' Methods." In a similar manner Hench[3] said, "Physical therapy remains the most potent single weapon at hand," and Pemberton and Osgood[4] asserted, "Any discussion of arthritis which does not at the same time develop, at length, the important field of physical therapy would be a medical incongruity obvious even to the laymen."

It is often thought that in order to apply physical measures satisfactorily the patient must be institutionalized. So often have patients been seen who were benefited by institutional physical treatment only to relapse promptly when they were dismissed from the institution, that I feel it is imperative to emphasize that it is frequently possible to prevent such relapses by continuing such procedures

* Read before the meeting of the Southeastern Section of the American Congress on Physical Therapy, Jacksonville, Florida, July 10, 1939.

at home. The average patient who has atrophic arthritis is financially unable to continue institutional treatment indefinitely. It is frequently necessary to offer a substitute for institutional treatment. With this in mind, I shall discuss the various types of arthritis from the standpoint of the main cause or characteristic, the use of institutional physical measures in conjunction with routine management, and especially, simple physical measures which may be applied in the home as a substitute for the more elaborate institutional methods.

Traumatic Arthritis

Traumatic arthritis may be divided into two categories: (1) extrinsic (exogenous), generally acute and accidental (often occupational or recreational); (2) intrinsic (endogenous), generally chronic, usually postural or static.

In the management of the extrinsic (usually acute) traumatic, intra-articular lesion (arthritis or synovitis), for example "baseball finger," the physician of course should consider all phases of management: reassurance, rest, support, the application of radiant heat, contrast baths, massage of graduated intensity and later, mild exercises during the period of recovery to restore range of motion. It will be noted that physical treatment plays an important part in this therapeutic program.

In the management of intrinsic (usually chronic) traumatic, intra-articular lesions (arthritis or synovitis) generally referable to repeated minor traumas associated with joint-strain due to such conditions as obesity, flat feet and scoliosis, the same general plan of treatment should again be considered. In this group, reassurance is needed. Rest of the involved joints is likewise indicated, and of particular importance is the elimination of every removable, irritating trauma of occupation, recreation or obesity. When the so-called microtrauma is caused primarily by obesity, reduction in weight is in order. This may, of course, be accomplished not only by dietetic management, but also by exercise. If the microtrauma is due to postural strains, physical measures are of importance and corrective exercises are definitely indicated. Likewise, other physical measures, such as heat, massage, special shoes and supports, are of value.

In the same category may be listed the extra-articular lesions such as traumatic fibrositis, traumatic bursitis, tendinitis, and the like, as for example housemaid's knee. For patients having such conditions, we advocate rest, elimination of the causative trauma, and if possible, supports, roller bandages or braces, and particularly physical therapy. Local applications of short wave diathermy or radiant heat, light or firm massage and, mild exercise during the later stages of recovery are all of value.

Specific Infectious Arthritis

Specific infectious intra-articular lesions (arthritis or synovitis) are generally acute, but may be chronic. In this group may be listed inflammations of joints of known causation, such as gonococcic, tuberculous, or syphilitic arthritis. As with other forms, a general program of treatment should be outlined and all the measures previously mentioned should be considered.

During the acute stage of gonococcic arthritis, a combination of sulfanilamide and fever therapy is definitely indicated when unfortified sulfanilamide therapy proves ineffective. In our experience, about 85 to 90 per cent of patients having gonorrhea have shown prompt response to sulfanilamide therapy when it has been properly administered. In conjunction with other routine treatment, however, physical measures, such as heat, massage, and exercise, may be of great advantage in overcoming periarticular adhesions and limitation of joint motion following the subsidence of acute inflammation in the joint attacked by gonococcic infection.

Whirlpool baths, contrast baths, diathermy and radiant heat may all be used to advantage as thermal agents for the treatment of such joints. Sedative massage and active assistive exercises will restore some measure of motion in joints that have not been too badly damaged, and rehabilitation of the patient will be much more rapidly accomplished by the employment of these physical measures.

Of particular importance from a physical standpoint are the dramatic results which can be obtained in the treatment of resistant gonorrhea by means of a combination of sulfanilamide and prolonged high artificial fevers. We have had in our fever therapy department fifty-three patients with very resistant gonorrhea who failed to respond to seemingly most adequate sulfanilamide therapy. To each of these patients we administered 80 grains (approximately 5 Gm.) of sulfanilamide a day for two days. On the third day we administered a single ten-hour fever at a bodily temperature of 106.8 F. (41.5 C.). The dosage of the drug was sufficient to increase the concentration of sulfanilamide in the blood to more than 9 mg. per cent. This has been considered adequate. Of our fifty-three patients, all but two had negative cultures following such treatment. The majority of the patients required only one long fever session, but a few required two or even three.

The procedure is difficult and should be employed only by trained workers under constant direct medical supervision. In our institution, a physician remains with the patient from the beginning to the end of the fever session. Results have been so successful that we no longer consider the treatment of gonorrhea to be a difficult problem. The percentage of failures in all cases is now so small as to be almost insignificant.

Fever therapy remains the most potent weapon available for resistant gonorrhea. The improvement in lesions of the joints is most spectacular. Nevertheless, the use of fever therapy is not recommended until other measures, including sulfanilamide or sulfapyridine therapy, have been tried and have failed. However, one should not delay fever therapy for too long a time.

Physical measures likewise play an important part in the treatment of tuberculous arthritis. Heliotherapy, judiciously employed, may be of value. Gradual exposure to the sun according to the method of Rollier is recommended in such cases. As for other types of arthritis, a routine program of treatment should be instituted.

In treating patients with syphilitic arthritis, artificial fevers induced by physical means may be used to advantage. In such cases, repeated fevers are usually administered twice weekly, the bodily temperature being elevated to 105 F. (40.5 C.) for five hours at each session.

Recently, we[5] have found that undulant fever (brucellosis) frequently responds to fever therapy, and one of our clinicians, Prickman, has pointed out that our studies suggested that "this type of therapy be tried in cases of chronic lesions of the bone, with or without sinuses, from which an organism of the Brucella strain can be cultured. . . . . " This suggestion offers new possibilities in the treatment of a lesion which has previously been considered highly resistant to all forms of therapy. I have seen a favorable response in one such patient who in over a year has had no recurrence of the lesions of the bone.

Physical measures may also be used to advantage at times in the treatment of specific infectious fibrositis and bursitis.

"Nonspecific" Infectious Arthritis

This group includes the greatest number of conditions commonly treated as arthritis. The etiology is really unknown; hence the term "infectious" may be questioned, although this type of arthritis is possibly related to streptococcal infections or to their toxins. This classification embraces various intra-articular

lesions associated with rheumatic fever, specific ulcerative colitis, scarlet fever and certain diseases of the skin, such as psoriasis, and erythema nodosum.

Recently we have been using fever therapy more frequently in rheumatic fever and we find that routine applications of heat, massage and exercise are a valuable adjunct in the management of that type of arthritis which is associated with ulcerative colitis. In treating patients having the special type of arthritis often seen in association with psoriasis, physical measures have proved a valuable adjunct. Psoriasis may be treated to considerable advantage by the tar ultraviolet radiation routine of Goeckerman,[6] and frequently with an improvement of the cutaneous lesions there often follows a remarkable reduction in the disease of the joints. Applications of heat and massage to the arthritic joints are also indicated. Roentgen therapy may prove efficacious.

Chronic Infectious (Atrophic or Rheumatoid) Arthritis

This same grouping concerns the form of arthritis which is most commonly dealt with and which in our clinic is usually regarded as "chronic infectious arthritis." Synonyms for this disease are "atrophic," "rheumatoid," "proliferative," "nonspecific," "infectious" or "infective" arthritis. It is in conditions of this major group that various physical measures may prove of great auxiliary value. It is well known that there is no specific therapy for this disease. In treating patients having chronic infectious (atrophic) arthritis it is essential that a well-thought-out program be considered. The physician never should rely on a single therapeutic measure.

It is well to consider the removal of definitely infected foci; to place the patient on a well-developed program of rest, general for the body and local for the joints; a carefully organized scheme of physical measures should be outlined, which should include the use of thermal agents, massage, manipulation, splints, supports (to prevent or correct deformities), exercises — local for the joints and general postural exercises — as well as occupational therapy. Simple analgesics may be used to advantage, and a general nutritious eliminative diet may be in order. Psychotherapy in the form of reassurance and special advice to the patient on how to "live with the disease" should be given.

Time does not permit a discussion of all phases of the management of these patients. The general program is listed in order to stress the fact that the use of physical measures is only one of its parts. The physical treatment will be discussed in some detail.

Rest. — All patients having chronic infectious (atrophic or rheumatoid) arthritis should have rest in definite amounts. This regimen should vary from a basic minimum of ten hours in bed at night and one hour of rest each morning and afternoon. During the acute stage of the disease, rest is of cardinal importance. After this stage has passed, the patient should be warned against injuring the joints by weight-bearing and instructed to avoid irritation from repeated aimless movements. He should never wiggle affected joints; instead, he should attempt to carry the joint through the full range of motion in each direction, once a day. This movement should be slow and rhythmic. Sir Robert Jones[7] has said, "No adhesions can occur in twenty-four hours which cannot easily be overcome."

The patient should avoid general fatigue rather than remain at absolute rest. He should avoid hurry and worry, and at the same time take enough nonfatiguing general exercise to improve metabolism and posture. He should also exercise the involved joints sufficiently to maintain proper mobilization and alignment.

Thermal Agents. — Certain simple physical measures for the application of systemic or local heat may readily be employed in the home. Hot baths taken in the patient's own tub may be of considerable value in increasing peripheral

circulation and general metabolism. The temperature of the water may range between 98 and 105 F. (36.6 and 40.6 C.) and the duration may vary between ten and forty-five minutes. At the beginning, lower temperatures and shorter periods should be employed. Emaciated and asthenic patients should be treated with care.

The full wet pack may also be used to advantage in the home. The bath or pack affords a mild form of home fever therapy raising the systemic temperature up to approximately 101 F. (38.3 C.).

Furthermore, with a little ingenuity, a simple home-made cabinet or steam bath[8] may be constructed. A simple home-made baker or inexpensive clamp lamp may be employed at home for local heating of one or more involved joints. The baker may be constructed by any electrician at a minimal cost. It consists of a framework of a strap iron or iron rod supporting a curved piece of polished sheet tin, beneath which four ordinary electric light bulbs are placed in double sockets. These bulbs may be of 60 or 120 watt size, depending on the amount of heat desired. The clamp lamp consists of a cup-shaped reflector for photoflash bulbs attached by a ball-and-socket joint to a small rubber-covered clamp which may be fastened to the back of a chair or the side of a bed. In this reflector should be placed a 250 watt Mazda CX bulb.[9]

These luminous heaters are to be preferred to the common electric heating pad. The latter often become too hot for local treatment and may burn the skin. Hench[10] has shown that the average low temperature of an electric heating pad is approximately 107.6 F. (42 C.), the medium temperature 181.4 F. (82 C.), and the high temperature 244.4 F. (118 C.), all too high for the local treatment of the average arthritic joint.

If electricity is unavailable in the home, local applications of ordinary hot paraffin may be substituted.[11] Practically every patient has in his home a stove and a double boiler, and can obtain some paraffin such as is used for sealing preserve jars. The paraffin is melted in the boiler and then permitted to cool until a thin film has formed on its surface. At this time, when the paraffin is at its low melting point, it is painted over the involved joint or other regions with an ordinary paint brush. About twelve coats are applied in rapid succession, and the thick layer is allowed to remain thirty to sixty minutes. It should never be applied over hairy skin without preliminary oiling or shaving. Rarely, a patient's skin is sensitive to paraffin and a slight rash is produced. In some instances a dressing of alternate layers of gauze and paraffin may be applied to an arthritic joint and left in place as a support for a period of twenty-four hours. If the dressing is sufficiently thick, it will retain its heat for at least an hour.

For years, contrast baths have been employed to advantage. Recent studies indicate that alternate periods of six minutes in hot and four minutes in cold water are more satisfactory than shorter periods. The hot water is kept at a temperature of 113 F. (45 C.) and the cold water at about 45 F. (7.2 C.). The entire session lasts about thirty to forty minutes. The patient should always begin and end with the hot water.

Local diathermy may occasionally be used to advantage, but may be substituted in most instances by simpler measures. When diathermy is applied, the newer short wave diathermy apparatus will produce more uniform, deeper heating than the old type of conventional diathermy devices. So far as has been determined to date, this agent produces no selective heating effects in the human body, and no specific bactericidal or physiologic effects have been proved other than those attributable to deep local heating. In my opinion local diathermy should rarely be employed for periods of less than a half hour, and would be more efficacious if applied for longer periods.

Heliotherapy. — Ultraviolet irradiation is of occasional value in chronic infectious (atrophic) arthritis, particularly if there is marked asthenia and sec-

ondary anemia. Graduated exposures to direct sunlight or to artificial ultraviolet radiation may be used. Inexpensive home treatment lamps are available. For example, the inexpensive S-1 lamp at a distance of two feet produces about the same quality and quantity of ultraviolet radiation as does June sunlight at noontime.

Massage. — Massage is contraindicated if there is acute pain on movement or a marked rise of temperature in the region of the affected joint. As a rule, direct massage over the joint is avoided, although extremely light stroking may occasionally be employed for reflex relief of pain. As the condition improves, the intensity of stroking and kneading of the muscles and soft tissues around the joint may be gradually increased in an attempt to improve the circulation and tone of the muscle.

While it is undoubtedly true that much harm may result from improperly applied massage, nevertheless, we have found that it is possible for a skilled technician to instruct a member of the family in a few simple maneuvers to augment professional treatments, which should always be ordered when available, or to replace professional treatment which is sometimes unobtainable. It is our custom to instruct the patient in a routine which may be used at home daily and also to advise professional treatment two or three times weekly in moderate cases or daily in severe cases.

I have been criticized for recommending the application of massage by unskilled persons. Skilled masseuses are, unfortunately, not universally available and the physician must help the patient to do the best he can with home treatment. We are convinced from long experience that when our own skilled technicians carefully instruct patients in home massage, much more good than harm will result.

Manipulation. — Forcible manipulation applied when the patient has been anesthetized may be a powerful weapon for the improvement of function of quiescent infectious arthritis. However, this is a strictly orthopedic procedure which requires much experience and skill. Shoulder, hip and knee respond particularly well to such manipulation. The elbow, wrist and fingers respond very poorly. Henderson[12] has particularly warned physicians concerning the need for experience in this procedure.

Manipulation under anesthesia is not always necessary, and the physician may often mobilize a joint by active assistive exercise. For this the patient makes an active effort to move the joint through its full range and is assisted by the operator in carrying the movement a little beyond this range. When applied slowly and skilfully once or twice a day, just after the part has been heated and massaged, the procedure frequently produces a gradual increase in range of motion and may obviate the need for manipulation under anesthesia. Active assistive exercise should always be attempted for at least three weeks before more severe measures are employed. The joint should never be jerked or pulled violently. The pressure should be applied slowly, gradually and just short of producing severe pain. If there is still increased pain in the joint twenty-four hours after such exercise, the measure was performed too severely, should be discontinued for one or two days and then applied less strenuously.

Splints. — In chronic infectious arthritis it is of primary importance to make every effort to prevent deformities. Once they have developed, it may take years to correct them. The deformities most likely to arise are adduction of the shoulders, thoracic kyphosis with fixation, flexion of the elbows, wrists or knees, loss of abduction of the hips, and foot drop. Proper application of splints will prevent these deformities. The patient's bed should not sag. At least twice a day all pillows should be discarded and the patient should fully extend all joints for half an hour. Once deformities have developed, wedged casts or traction may be necessary to overcome contractures. It is particularly important to remem-

ber that these patients should avoid the constant use of pillows under the knees, because this is one of the most frequent causes of flexion contractures of these joints.

Shoes and Supports. — Shapeless bedroom slippers should never be worn continually. It is often erroneously believed that such slippers are more comfortable than shoes. Actually, they merely exaggerate deformities and are not as comfortable as well-fitting shoes equipped with metatarsal bars, heel pads or wedges and soft felt pads under the longitudinal arches. Rigid metal arch supports tend to produce atrophy of the plantar muscles. Elastic supports, or bandages, are frequently of value when applied to the knee or ankle, but are rarely of benefit to other joints. Sacro-iliac belts occasionally afford comfort.

Exercise. — Exercise is essential in the chronic type. If the inflammation is acute, when motion is started prematurely, nature's warning in the form of severe pain and spasm will usually prevent continuation of such motion. As soon as the patient starts wary voluntary movements, this is the signal for the inauguration of gentle, passive motion by the physician. Exercises should be graduated slowly from passive motion to active assistive motion and finally to full active exercise. At the outset, knees should be exercised with the patient in the prone position to avoid the strain of weight-bearing. The knees should always be straightened as much as possible before walking is attempted. The joint exercises should be slow and rhythmic and through the fullest range of motion that is painless. Jerking, wiggling and pump handle movements, should be avoided. One slow, daily movement through the fullest possible range is preferable to many lesser ones through a partial range of motion.

Postural Exercises. — Corrective postural exercises tend to rebalance the body so that there is better alignment of the joints and avoidance of strain. Special attention should be directed toward exercises for the feet and attempts should be made to correct their pronation.

Exercises Under Water. — Exercises performed under water are often of much value in the treatment of extensive atrophic arthritis. Some of these may be done in the patient's own bath tub, or a Hubbard tank may be constructed for home use. While the patient is in the hot water, massage and exercises may be administered under water during the period of maximal hyperthermia. Such baths may produce mild febrile reactions not unlike those of typhoid vaccine. The bodily temperature may readily be raised within thirty minutes to 101 F. (38.3 C.). Movements can be carried through a greater arc with less pain under water. Owing to the buoyancy of the water, weak muscles are capable of a greater amount of work.

Occupational Therapy. — Occupational therapy may prove to be extremely valuable in the rehabilitation of patients having chronic infectious (atrophic) arthritis. It provides a form of pleasurable corrective exercise. For the knee, hip or ankle, a velocipede jig saw may be used, or at home a stationary bicycle may be substituted. For the ankle a foot pedal scroll saw or ordinary sewing machine is appropriate, while modeling with clay or hammering and planing are of value for exercising stiff fingers and wrists. Suitable exercises for the shoulder, elbow and upper part of the back include basket-making and loom-weaving, with the materials placed high enough to increase the upward range of shoulder motion during work.

The extra-articular forms of "non-specific infectious arthritis" may be divided into infectious fibrositis and rare forms of myositis. Chronic infectious fibrositis is the most important and frequently overlooked form of extra-articular lesion. Slocumb[13] has described this condition in careful detail. This classification refers to such conditions as "capsular rheumatism," "periarthritis," and

"periarticular fibrositis." There is also a muscular fibrositis which may be localized, as in lumbago or torticollis, or diffuse as in "generalized muscular rheumatism." There is also a bursal fibrositis, as in subacromial bursitis, and a perineural type, as in certain forms of sciatica. Lastly, there is tendovaginitis; for example, Dupuytren's contracture or tendon ganglion.

While physical therapy is of little aid in the rare forms of myositis ossificans and myositis fibrosa, it is of extreme value in the different types of fibrositis. Fibrositis, which is described at great length in the Continental literature, is frequently overlooked in this country. It is a chronic inflammation of white fibrous tissue characterized particularly by the formation of small palpable nodules or indurations in the subcutaneous tissue or muscles.

It has been repeatedly stated by British authors that firm, local massage will "break up" many of the nodules with subsequent relief of pain and muscular spasm. The physical treatment consists of local applications of heat followed by extremely heavy massage. Ordinary massage is of little or no value. It is essential to establish the precise diagnosis before heavy massage is applied, since it is contraindicated in the intra-articular types of arthritis and is indicated only in infectious fibrositis. Daily applications of heat and firm massage over a prolonged period will tend to lessen the intensity of "flare-ups" of fibrositis and provide much comfort to the patient, though they will not effect a complete cure.

Degenerative and Special Types of Arthritis

The intra-articular (senescent or hypertrophic) form is the second most frequently encountered type of arthritis. Synonyms are "degenerative osteo-arthritis" and "spondylitis osteo-arthritica." Heberden's node of the finger is a form of degenerative arthritis. Affecting the knees, the "static arthritis of obesity" and "menopausal arthritis" may be placed in this category. The "hypertrophic spinal column of the elderly" and in the hips, morbus coxae senilis, are included in this classification. Physical treatment plays an important part in these various forms of senescent or hypertrophic arthritis.

As with other forms, physical therapy should be fitted into a general therapeutic program. Our program consists of: (1) Reassurance, because it is particularly important for this form. The condition is essentially *not* an ankylosing, severely progressive and crippling disease, as chronic infectious (atrophic) arthritis may be. It is a nuisance, not a calamity. Since every arthritic person pictures to himself a friend who has marked deformity, it is essential that he be informed that this type does not, as a rule, result in deformities. (2) Elimination of every removable irritating trauma of occupation, recreation or obesity. (3) Physical therapy in the form of heat, contrast baths, massage and mild exercises. (4) Occasionally roentgen therapy. (5) Nutritious, anticonstipation diet with avoidance or correction of obesity. (6) Supports: corsets (spine), cane, roller bandages (knees). (7) Removal of obviously infected foci (without promises to the patient of good results). (8) Vaccines are of debatable value. In the management of senescent arthritis, physical measures are modified considerably from those used in atrophic arthritis. Local thermal applications, particularly contrast baths, may be of value. Mild systemic heating may also be somewhat beneficial, but should be used with caution, since hypertrophic arthritis usually occurs in the aged. Massage tends to overcome the moderate stiffness of joints which characterizes hypertrophic arthritis, and the milder exercises usually suffice to maintain mobility of the joints.

It has been pointed out by Goldthwait and his associates[14] that hypertrophic arthritis always involves the points of greatest chronic strain in the spine, neck, fingers, knees and hips. With the exception of the fingers, all these joints are involved in bearing weight, and it seems logical to assume that postural exercises would tend to lessen the strain on these joints by improving alignment.

Therefore, general postural exercises should be considered in senescent (hypertrophic) arthritis. A simple program of physical treatment of this kind will usually prove adequate.

One condition frequently associated with hypertrophic arthritis of the cervical portion of the spinal column is often benefited by a special type of physical treatment, and deserves mention. Hypertrophic changes about the lower three cervical intervertebral spaces are extremely common and secondary radiculitis with referred pain in the shoulder girdle, arm or precordium is frequently associated with these changes. It has been pointed out by Nachlas[15] that pain in the thoracic wall may be so severe as to be confused with angina pectoris. He said that the common denominator in such cases was involvement of the lower cervical portion of the spinal column, associated with thoracic pain, and that certain fibers of the brachial plexus arise in this region of the cervical portion of the spinal column and send motor nerves to the regions mentioned. Since these are motor nerves, supposedly without sensory fibers, it is possible that the absence of such fibers has been responsible for the failure of observers to correlate the cervical lesion with the thoracic pain. Nachlas then observed that it had been clearly established, however, that motor nerves can possess protopathic sensations, so that such a nerve will produce a definite pain, diffuse in character with reference to its terminal portion.

Turner and Oppenheimer[16] further pointed out that when there was pain in the shoulder, arm or precordium, in association with hypertrophic arthritis of the cervical portion of the spinal column, there was also an actual narrowing of one or more intervertebral spaces with an associated narrowing of the intervertebral foramina. Such narrowing might readily produce pressure on the nerve roots.

Hanflig[17] has suggested that in such instances cervical traction with forced rotation of the neck be applied. Many patients having hypertrophic arthritis of the cervical portion of the spinal column complain of such pains in the shoulder, arm or thoracic wall. The condition is frequently overlooked and may be diagnosed as "intercostal neuritis," "brachial neuritis," "periarthritis of the shoulder," "fibrositis" or even, as Nachlas has pointed out, "angina pectoris." Physical measures often produce relief, and in some instances the relief may be dramatic.

At the clinic it has been our plan to administer radiant heat, diathermy or roentgen therapy to the cervical portion of the spinal column, followed by sedative massage and cervical traction by Sayre's head sling. During traction the patient's head is gently but forcibly rotated in each direction, as suggested by Hanflig. Repeated treatments often relieve the referred pains. They may be administered at home by a simple heat lamp, followed by massage and traction applied by means of a simple home-made cloth head sling.

This type of radiculitis, I believe, is much more common than is generally recognized, and should be sought for and treated as suggested. The beneficial results would seem to justify the therapeutic effort.

In treating patients who have chemical (metabolic or endocrine) arthritis, which includes such conditions as gouty arthritis and hemophilic arthritis, physical measures are of little value, except that they may occasionally produce symptomatic relief of pain or stiffness.

For neoplastic lesions of the joints, such as chondromatosis or metastatic tumors (carcinoma or sarcoma) the only physical agent that is of any value is the roentgen ray.

Among the miscellaneous forms of arthritis may be classed the various "mixed types," as well as the functional forms such as the "hysterical joint" or the myalgia of fatigue and exhaustion. Physical measures may prove of great value in the care of the so-called hysterical joint, since with proper psychologic

preparation they may be used as spectacular and tangible means for the required suggestion and cure of the hysteria. In the myalgia of fatigue, heat and massage will frequently remove the products of fatigue and hasten restoration of function.

Conclusions

Physical treatment plays an important, probably the most important, part in the modern management of the various forms of arthritis. It is essential that the physician who applies these measures be thoroughly acquainted with the various types of arthritis and that a careful diagnosis be established before treatment is inaugurated. Physical measures must be applied only as indicated by the particular type of arthritis. Much of this therapy may be employed by the family physician in the patient's own home. More extensive use of physical therapy by practitioners in general unquestionably will be of great benefit to the large group of unfortunate sufferers from this dread disease.

References

1. Fox, R. F., and Van Breemen, J.: Chronic Rheumatism; Causation and Treatment, London, J. & A. Churchill, 1934, p. v. (preface).

2. Copeman, W. S. C.: The Treatment of Rheumatism in General Practice, Baltimore, William Wood & Co., 1933, p. 112.

3. Hench, P. S.: Acute and Chronic Arthritis, in Nelson Loose-Leaf Surgery, New York, Thomas Nelson & Sons, 1936, vol. 3, p. 154.

4. Pemberton, Ralph, and Osgood, R. B.: The Medical and Orthopedic Management of Chronic Arthritis, New York, The Macmillan Co., 1934, p. 243.

5. Prickman, L. E.; Bennett, R. L., and Krusen, F. H.: Treatment of Brucellosis by Physically Induced Hyperpyrexia, Proc. Staff Meet., Mayo Clin. **13**:321 (May 25) 1938.

6. Goeckerman, W. H.: Treatment of Psoriasis; Continued Observations on the Use of Crude Coal Tar and Ultraviolet Light, Arch. Dermat. & Syph. **24**:446 (Sept.) 1931.

7. Jones, Robert: The Problem of the Stiff Joint, Brit. M. J. **2**:1019 (Dec. 5) 1931.

8. Krusen, F. H.: Light Therapy, ed. 2, New York, Paul B. Hoeber, Inc., 1937, pp. 238.

9. ————: A Simple, Inexpensive Heat Lamp, J. A. M. A. **107**:780 (Sept. 5) 1936.

10. Hench, P. S.: Discussion. Abstracts of Papers and Discussions, Fifth Annual Fever Conference, May 2 and 3, 1935, Dayton, Ohio, pp. 87-88.

11. Krusen, F. H.: The Simple Paraffin Bath as a Means of Applying Heat Locally When Other Means Are Not Available, Proc. Staff Meet., Mayo Clin. **12**:73 (Feb. 3) 1937.

12. Henderson, M. S.: Physical Therapy and the Management of Stiff Joints, Arch. Phys. Ther. **17**:562 (Sept.) 1936.

13. Slocumb, C. H.: Differential Diagnosis of Periarticular Fibrositis and Arthritis, J. Lab. & Clin. Med. **22**:56 (Oct.) 1936.

14. Goldthwait, J. E.; Brown, L. T.; Swain, L. T., and Kuhns, J. G.: Body Mechanics in the Study and Treatment of Disease, Philadelphia, J. B. Lippincott Co., 1934, pp. 281.

15. Nachlas, I. W.: Pseudo-angina Pectoris Originating in the Cervical Spine, J. A. M. A. **103**:323 (Aug. 4) 1934.

16. Turner, E. L., and Oppenheimer, Albert: Common Lesion of the Cervical Spine Responsible for Segmental Neuritis, Ann. Int. Med. **10**:427 (Oct.) 1936.

17. Hanflig, S. S.: Pain in the Shoulder Girdle, Arm and Precordium Due to Cervical Arthritis, J. A. M. A. **106**:523 (Feb. 15) 1936.

COMBINED COAGULATION AND IONIZATION OF CERVICAL EROSIONS AND ENDOCERVICITIS *

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The object of this paper is to report a method for the treatment of cervical erosion and endocervicitis that is effective and obviates most of the objectionable features of the methods in use at present. A survey of the literature relative to the treatment of endocervicitis and cervical erosion shows a great diversity of opinions and no method of choice. Experience with treatments that range from the ultra-conservative to the ultra-radical has not generally given satisfactory results. These treatments include vaginal douching, tamponade, topical application of astringents, ultraviolet radiation, electrocauterization, Hyams' conization, Cherry's method of bipolar coagulation, Sturmdorf's operation and other more or less formidable procedures. The radical forms of treatment are not always effective even in the hands of an expert. The chances of hemorrhage as a complication and of stenosis of the cervical canal as a sequela are considerable. Conservative methods do not remove the underlying pathologic process and give but temporary relief.

The method to be described is one which may be used by the general practitioner with safety and offers the following advantages: No recurrence, little or no bleeding, no stenosis of the cervical canal, little or no pain, an office procedure and a simple technic that is easily mastered.

Analysis

This report is based on a study of 210 patients who were given this treatment at the hospital and at my office. Of this number, 180 were seen after varying intervals subsequent to discharge, and 30 could not be reached. In all cases a record was made of the patient's age, marital status, number of pregnancies, local and general symptoms and the pathologic process. Whenever possible, the subsequent course of the local and general symptoms and the condition of the cervix was noted in the follow-up examination.

Of the 210 cases of this series, 2 were colored and 208 white, with a wide representation of nationality. The youngest patient was an 8 year old girl suffering from vulvovaginitis which did not respond to treatment although the patient became negative for gonococci. Examination of the cervix with a lighted urethroscope revealed a marked cervical erosion. After the erosion was cured with copper ionization the vaginitis cleared up. The oldest patient was 58. The average age of all was 33.6 years. The age group between 25 and 40 comprised 72 per cent of the series, indicating the prevalence of endocervicitis and cervical erosion during the child bearing period. Twenty-five per cent of the patients were nullipara, 24 unipara and 51 multipara. The relationship of this condition to injury during labor is shown by the recurrence of the erosion after a subsequent pregnancy in 12 cases. The duration of the condition prior to treatment was less than a year in 28, from 1 to 2 years in 30 and more than 2 years in 42 per cent. Four patients who had had hysterectomy performed some time before developed endocervicitis and erosion of the cervical stump. In all four, the lesion responded to the treat-

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ment as in the other cases and were cured. Whether the cervical erosion was present prior to the operation could not be ascertained.

Symptoms

The symptoms of endocervicitis and cervical erosion may conveniently be considered under (1) local, and (2) reflex symptoms.

Leukorrhea was the most frequent local symptom. That only 80 patients mentioned vaginal discharge as a troublesome symptom was probably due to the daily douching practiced by most women. Lower back pain was mentioned by 58 patients. Other local symptoms were heaviness in the perineal region, dyspareunia, staining after coitus, suprapubic pain, frequent urination, vulvar pruritus and sterility. Of the total number of patients, less than half complained of symptoms referable to the pelvis. With few exceptions, however, all complained of symptoms referable to other parts of the body.

The reflex symptoms are many and protean in nature. No organ or system is immune. In our series, 102 patients complained of symptoms referable to the gastrointestinal tract, gall bladder region and right iliac fossa. Psychic symptoms such as irritability, crying spells, fainting spells, change of behavior, disorientation and inability to concentrate on household duties were the complaints of 29 patients. Neuralgia, neuritis and paraesthesias were occasionally found. Single and multiple joint symptoms were the complaint of 49 patients. The lower extremities were most often involved. Next in frequency were the shoulders, elbows and smaller joints. Many complained of anginoid pain and other cardiovascular symptoms. General symptoms such as fatigue, weakness, dizziness, dull perception, headache, general aches and pains, loss of weight, anorexia and insomnia were the complaints of 118 individuals.

The tendency to involvement of organs remote from the pelvis was noticed many years ago by Marion Sims, the patron saint of womanhood, who cured many of his patients by correcting the pathologic processes of the cervix. It is noteworthy that in almost all patients the reflex symptoms remote from the site of the lesion disappeared long before the endocervicitis and erosion were completely cured, and in many cases after the first treatment. The following cases illustrate this.

Case 1. — Mrs. N. F., 54, white, para 5, was referred by the medical department of Beth Israel Hospital with a diagnosis of sciatica of the right side, to the physical therapy department for treatment. She complained of severe pain in the right gluteal region radiating to the thigh and leg, and inability to walk. The pain was so severe that her husband had to aid her in walking. Examination of the pelvis revealed an extensive second degree cervical erosion. This was immediately coagulated, the cervical canal ionized and a tampon inserted. On leaving the table she, as well as myself, was agreeably surprised at her ability to walk unaided. Her so-called sciatica completely disappeared when the erosion and endocervicitis were cured.

Case 2. — Mrs. C. W., white, 28 years old, para 2, came to my office 4 years ago complaining of severe pain, swelling and tenderness of the right knee, general weakness, low back pain, loss of weight and leukorrhea. The heart, lungs, gastrointestinal tract, gall bladder, kidneys and blood pressure were normal. On pelvic examination, a marked second degree cervical erosion and endocervicitis were found and the routine treatment was instituted. When she came for a second treatment 2 days later, all signs and symptoms of the arthritis of the knee had disappeared and have not returned since.

It is gratifying to note the large number of cases in which the digestive, arthritic or nervous, as well as general symptoms, disappeared after the cervical erosion was removed. Whether this was accomplished by closing the channels of absorption of toxic materials when the erosion was coagulated, or by blocking the passage of painful sensations through the afferent nerve fibers, I do not know.

Pathology

Before discussing the pathology of endocervicitis and cervical erosion, it is important briefly to review the anatomy and physiology of the lower genitourinary tract in women, laying stress on a few points that have an important bearing on the subject under discussion. It is important to remember that the uterine cavity is lined with cuboidal, the cervical canal with columnar, and the vaginal portion of the cervix with stratified epithelium. It is likewise of value to know that the reaction of the cervical canal is alkaline and that of the vagina is acid. The glands of the cervical canal are of a racemous type penetrating deep in the submucosa of the cervix, and secrete a comparatively thick mucus. The mucosa of the uterine cavity is shed and replaced by a new lining every month.

With these facts in mind we may proceed with the discussion of the pathology of endocervicitis and cervical erosion. In the cervix, as in any other part of the body, inflammation is the reaction of the body to mechanical, chemical or bacterial injury. Given an injury to the cervix following parturition, abortion or faulty instrumentation, there is either a descending or ascending infection. As a result of the infection there is an increased blood supply to the cervix, causing a greater activity of the cervical glands which pour forth a greater quantity of secretions. This mucopurulent discharge irritates the stratified epithelium lining the vaginal portion of the cervix and ultimately macerates it. Nature, in its effort to heal, sends down the more active proliferating columnar epithelium of the cervical canal to cover the raw surface, thus forming what is known as an erosion. In reality, there is no loss of tissue but rather a displacement of the stratified squamous epithelium by columnar epithelium which is adapted to an alkaline environment. In the majority of these women there is some form of uterine displacement bringing the cervix in contact with the wall of the vagina against which it rubs. And, as a multitude of bacteria is always found in the vagina, the three exciting causes of inflammation are present; namely, mechanical, the eroded cervix rubbing against the vaginal wall; chemical, the eroded cervix being constantly bathed in a hostile acid medium; and the bacterial invasion due to the presence of pathologic germs that inhabit the vaginal tube. The organisms most frequently found are streptococci, staphylococci, gonococci, colon acilli, smegma acilli and a great variety of other germs. As a result of these three factors, inflammation of the vaginal portion of the cervix sets in, which in turn results in an increased blood supply to the affected parts. There is also round cell infiltration and increased vascularization in the inflamed cervix resulting in fibrosis and, in some cases, marked increase in size. The lymphoid cells and fibroid tissue cause pressure upon the racemous glands of the cervix, occluding their mouths and thus producing cysts of varying size and number which feel like shot on bimanual examination and appear as pearly white spots on visualization of the cervix. Some pathologists believe that cysts are caused by plugging of the mouths of the ducts with bundles of stratified epithelium in their efforts to overgrow the columnar epithelium covering the eroded surface.

Diagnosis

The diagnosis is made easily if the pelvic organs of every woman are examined. I have made it a rule to examine manually and with a speculum the genitourinary tract of every female patient consulting me, no matter what the complaints may be. By so doing, one is apt to discover disease of the cervix which would otherwise be missed. Judd stated that 15 per cent of the cases of carcinoma in women begins in the pelvis and that if recog-

nized early and properly treated, almost all can be saved. As most authorities agree that a cervical erosion is a precancerous lesion, it becomes apparent how important it is as a prophylactic measure against carcinoma to make an early diagnosis so that appropriate treatment may be instituted, thus preventing the development of malignancy. There is a peculiar velvety feel of the eroded cervix that may be missed when examined with a gloved hand. In a second degree erosion, however, a rough irregular surface studded with numerous small shot-like masses is felt and the cervix is greatly enlarged. The consistency of the cervix may be hard when there is a marked fibrosis, or soft when there is subinvolution and passive congestion. There is usually some form of displacement of the uterus and in many cases tender inflamed adnexa. On exposing the cervix with a suitable speculum, a mucous or mucopurulent discharge of varying consistency adherent to the mucosa and occasionally plugging the external os is observed. When this discharge is wiped off, the cervical mucosa appears red, edematous, irregular, resembling very much a strawberry. In many cases, pearly white spots varying in size and number are seen to surround the os. These are nabothian follicles. In multipara, cervical lacerations of varying degrees take place. Ectropion and polyps are frequently associated conditions.

Differential Diagnosis

Cervical erosions have to be differentiated from:

1. early pregnancy
2. malignancy
3. tuberculous ulcerations of the cervix
4. syphilitic ulcerations of the cervix
5. lymphogranuloma venereum
6. trichomonas vaginalis.

In many cases of early pregnancy the first visible sign is a red areola of varying size and intensity surrounding the os, which cannot be differentiated from a first degree cervical erosion. However, the history, positive signs of pregnancy, and an Aschheim-Zondek test will facilitate a correct diagnosis.

In malignancy the tissue is more friable, bleeds easily on touching, is more indurated, the surface does not take the iodine stain and the lymph nodes of the region draining the pelvis are enlarged. There is usually distortion of the cervix and cervical canal. A probe easily pierces the tissues and causes profuse bleeding. Biopsy will prove decisive.

In tuberculous ulceration there is a true loss of tissue, ragged, undermined edges, a pale anemic appearance of the cervix, and in the majority of cases evidence of tuberculosis of other parts of the body. A positive smear or culture renders the diagnosis absolute.

In syphilitic ulcerations of the cervix there is a loss of tissue and marked induration of the edges of the sore. A dark field examination and a Wassermann test will establish the diagnosis.

With the increase of the colored population in this part of the country of late, lymphogranuloma venereum has to be kept in mind as a possibility. The Frey test is the only means of making a correct diagnosis.

In trichomonas vaginalis there is a more profuse foamy discharge. On wiping it off the vaginal mucosa appears rough and red and the cervix may not show erosion. A fresh hanging drop examined under the microscope will show the characteristic organism.

Equipment

The equipment necessary for the application of the technic under consideration consists of a high frequency generator of the long or short wave type, a galvanic generator producing a smooth direct current, a percolator of 1 or 2 gallon capacity, an instrument to carry the desired solution and the galvanic current to the cervical canal, a good light, a foot switch, and a small ball electrode.

The instrument I have designed for ionizing the cervical canal and eroded cervix consists of a body and stem (fig. 1). The body is a fusiform rod made of copper or an alloy of the same metal. Some of the instruments have a rounded metal tip, while others have an insulated tip to prevent concentration of the current. At its junction with the stem, the active intracervical part ends in a ball shaped bulge with a convex or a concave surface to fit the cervix. The bulge and the cervical rod have minute perforations to permit a spray of the ionizing solution to bathe the cervical canal, the eroded part of the cervix and the vaginal mucosa. The stem, 12 inches in length, is made of brass tubing insulated with hard rubber or bakelite and carries the current and the solution to the active part of the instrument. The distal end is covered with a cap to attach the rubber hose of the irrigator and a cord of the galvanic generator. The electrode is made for me by the Garshelis Laboratories in several shapes and sizes.

Technic

The method I am using at present I have found applicable to all cases of cervical erosion and endocervicitis. It consists of two parts:

1. Coagulation of the eroded areas of the cervix and the lower end of the cervical canal for about one-quarter inch with the bipolar high frequency current and coagulation of cysts if any are present.

2. Copper-mercury or zinc-mercury ionization of the cervical canal. Experience has taught me that coagulating the erosion no matter how small and insignificant the lesion may be, shortens the time of a cure and cuts the number of recurrences to zero. I have cured some cases with coagulation alone, others with ionization alone, but never so complete and rapid a cure as with the combination of the two.

The technic is simple. The patient, properly draped, is placed in the lithotomy position on a gynecologic table equipped with a receptacle to hold the fluid as it returns from the vaginal outlet. A metal plate 6 by 8 inches to act as an indifferent electrode is placed on the lower abdomen and held in position with a sand bag. The foot switch and ball electrode are connected to the high frequency generator which is set to deliver the proper strength of current for coagulation. The cervix is exposed with any suitable bivalve vaginal speculum, the light adjusted for good illumination, and the cervix wiped dry with cotton on an applicator. Controlling the current with the foot switch, the sterile ball electrode is then applied to the eroded surface of the vaginal portion of the cervix including a quarter of an inch margin of the healthy mucosa. The ball electrode is moved slowly clockwise in a circle toward the cervical os until the entire surface is coagulated. On reaching a Nabothian cyst, the ball electrode is held over it until a sizzling sound and a sudden pop is heard. This indicates complete destruction of the sac of the cyst by heat and high steam pressure and there will never be a recurrence. The lower end of the cervical canal at the junction of the external os, for about a quarter of an inch, is also coagulated to insure the destruction of deep-seated infected glands which are always present at this site. With

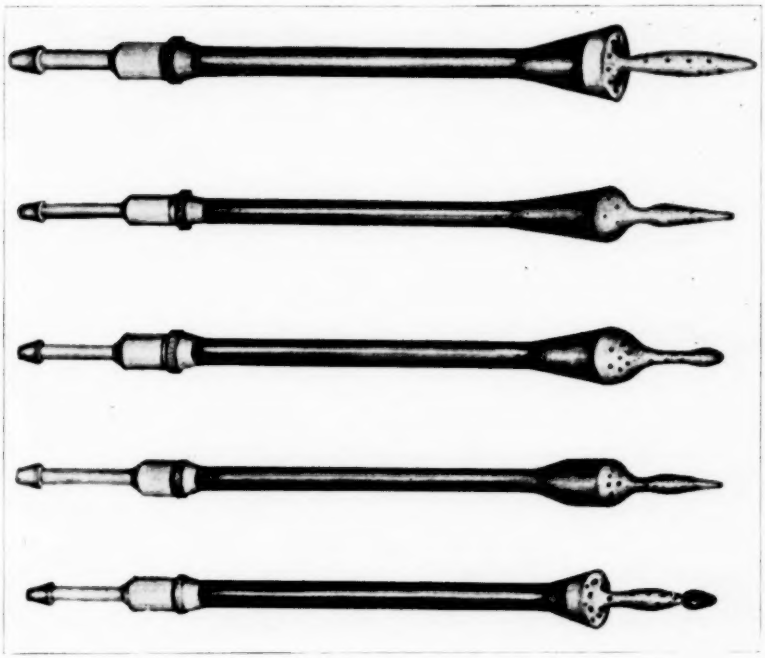

Fig. 1. — Derow irrigating ionization electrodes for the cervix.

this technic, one has perfect control of the depth of coagulation by varying:

1. the size of the ball electrode,
2. the setting of the machine,
3. the rate of motion of the ball electrode, and
4. the pressure exerted on the electrode as it is moved along.

The operation is rapid, almost painless, and a safe office procedure. When a short wave high frequency machine is employed, an insulated pad is used instead of the bare metal electrode, but the technic is the same.

With the coagulation completed, the metal plate on the lower abdomen is replaced by a wet pad for the indifferent electrode connected to the negative pole of the galvanic generator. A proper sized irrigating electrode is selected, dipped in the amalgam solution and introduced into the cervical canal. The solution I use to apply the mercury amalgam consists of chemically pure nitric acid, one part, water three parts, and some metallic mercury (quicksilver). When the electrode is dipped into this solution, a film of mercury instantly covers the surface of the metal. The electrode is then washed with sterile water and wiped with a sterile towel. This method may be conveniently used to sterilize all cervical, urethral, vaginal and rectal electrodes. The advantages of this method of sterilization are: It is rapid, there is no need of boiling the instruments thus prolonging the life of the insulation, the instrument is freshly plated before each treatment, and after wiping presents a bright, smooth, velvety, slippery surface, obviating the need of a lubricant. The speculum is then removed, the rubber hose of the irrigating outfit is attached to the stem of the cervical electrode, and the positive pole of the galvanic generator is likewise connected to the stem. The stopcock of the irrigator is opened to allow a steady flow of the solution which consists of two ounces of powdered copper or zinc sulfate to two gallons of water. In some cases with a markedly enlarged, soft, boggy, passively congested uterus, one ounce of alum is added to the irrigating solu-

tion for its astringent effect. The percolator containing the solution should not be raised more than 24 inches above the patient. The direct current is then slowly introduced until the meter indicates a flow of 15 to 20 ma. The time consumed in emptying a 2 gallon irrigator is usually 15 to 20 minutes, which is the duration of the treatment. At the end of the treatment the current is gradually turned off, the electrode removed and a tampon dipped in a solution of

Ichthammol	6 Gm.
Liquified Phenol	3 cc.
Glycerite Boroglycerin	20 cc.
Glycerite Hydrastis	5 cc.
Tincture Iodine	2 cc.
Alcohol	2 cc.
Glycerin qs. ad	100 cc.

is inserted. The patient removes the tampon the following day and douches with a mild antiseptic or deodorant solution twice daily. This irrigation-ionization treatment is continued twice weekly until complete healing takes place. In about eight days following the first treatment, the destroyed mucosa begins to separate and granulation tissue appears at the margins. This process continues for three or four weeks when the slough separates completely. Within ten days more the cervix is covered with a layer of normal stratified epithelium. It is advisable to inform the patient that there will be a marked increase in the vaginal discharge, in some cases blood stained, for two or three weeks when the slough separates. The usual time necessary for a complete cure is between five and six weeks.

The appearance of the cervix before and after treatment is characteristic. The coagulated cervical mucosa assumes a grayish-white color and the destroyed cysts show slight depressions from which a thick mucopurulent substance oozes out. After copper sulfate ionization, the grayish-white color changes to a greenish-blue color covering the coagulated surface of the cervix. After the completion of the cure the mucosa assumes the normal pink of a healthy cervix. These changes are shown in figure 2.

When the restoration of normal cervical tissue is complete and the discharge has ceased, I give one or more irrigating ionization treatments with the negative pole, using a weak iodine solution. The object of this change is to soften the slight hardening produced by the positive pole of the direct current and to restore the normal alkaline reaction of the cervical canal.

In some cases, it is necessary to treat the residual morbid process of the pelvis with diathermy or short wave and sinusoidal currents to remove indurations, to correct uterine displacements and to ease pain.

Contraindications

The contraindications of this treatment are: acute pelvic inflammation, such as salpingitis, endometritis, perimetritis, pelvic peritonitis, acute gonorrhea; pregnancy, malignancy, diabetes, syphilis and tuberculosis of the pelvic organs.

In acute pelvic inflammation particularly with pus formation and in acute gonorrhea, it is best to treat the condition with general hyperpyrexia or local hyperthermy or any other method until the acute stage is over, when the erosion and endocervicitis may be treated.

Pregnancy is usually a contraindication to this form of treatment although I have treated three pregnant women without any untoward effects. Two patients in early pregnancy complained of a severe odorous discharge

that caused great discomfort and mental suffering. Because these patients insisted on relief I decided to proceed with the regular technic, with the result that they were cured of their abnormal condition and gave birth to healthy children at full term. In the third case, I did not make the diagnosis at the time, but pregnancy progressed normally to full term.

Malignancy, syphilis and tuberculosis should be treated with the method of choice in each condition.

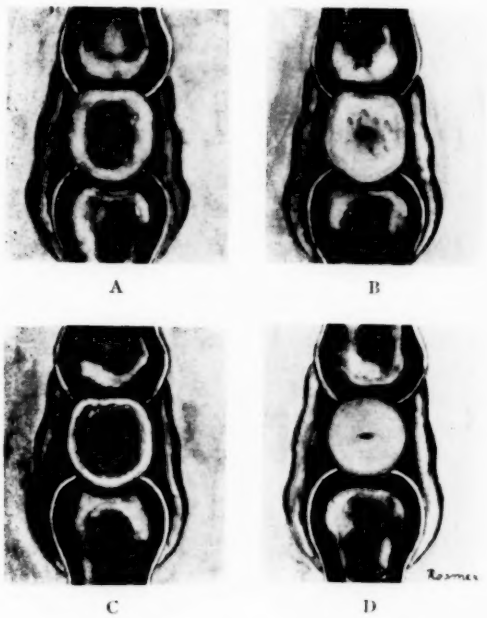

Fig. 2. — *A*, cervical erosion before treatment; *B*, erosion and cysts coagulated; *C*, cervix ionized with copper sulphate; *D*, cervix healed after six weeks.

In diabetes one should first get a normal blood sugar by diet or insulin or both, then proceed with the cure of the erosion and endocervicitis. The following case will illustrate how careful one has to be in treating a diabetic:

Case 3. — Mrs. A. S., 52 years old, mother of seven children, came to my office June, 1928, complaining of pain in the lower back, a heavy sensation in the perineum, leukorrhea, slight bleeding after coitus, loss of weight, general weakness and insomnia. On examination, the heart, lungs and blood pressure were normal. On pelvic examination, a second degree erosion and endocervicitis were found. Her urine showed 4 per cent glucose, otherwise negative. After putting her on a diet, she became sugar-free in a week when I decided to treat the erosion and endocervicitis. The erosion was coagulated, the nabothian follicles destroyed and copper ionization applied to the cervical canal with the technic described above, and she was ordered to return in three days for subsequent treatment. When she came to the office on the third day, she complained of not feeling well and looked toxic. Her temperature was 100.5 F., pulse 100, and her urine showed 2 per cent sugar. On examination the entire cervix appeared edematous, ashy gray in color, and very tender. It appeared as though the entire vaginal portion of the cervix would slough off. To restore the blood supply of the cervix, I applied pelvic diathermy on four successive days, when improvement set in. From then on, she made a complete recovery. The worry incident to this case caused me to put diabetes on the list of contraindications.

Discussion

The method used most frequently by surgeons as well as medical men is the electro-cauterization. The technic is simple, but painful, requiring a local anesthetic. The process has to be repeated several times, and when

the cervical canal is to be treated the patient has to be hospitalized. The resulting hard scars may cause dystocia and hemorrhage should the patient become pregnant. Cauterization therefore is not only inconvenient but contains an element of potential danger that cannot be disregarded in the treatment of women during their child bearing period.

The Cherry method of bipolar coagulation of the mucosa of the cervical canal is a painful procedure requiring a local, and with some neurotic patients, a general anesthetic. The possibility of hemorrhage when the slough separates and of stenosis of the cervical canal after healing is considerable. It is true that in the hands of as skilled an operator as Dr. Cherry the results are good, but when a form of treatment is to be used by the general practitioner, it must be simple and foolproof, which I daresay it is not.

The same may be said of Hyams' conization with the addition that the technic requires greater skill and the chances of hemorrhage are proportionately greater when the cutting current is used due to the thinner film of coagulated tissue. This procedure is painful requiring a local or general anesthetic. I know of at least one case that required a transfusion on the twelfth day after the conization had been performed by an internationally known gynecologist, in order to save the life of the patient.

The Sturmdorf operation and all similar procedures are too formidable, require hospitalization, and the resulting puckered, scarred cervix is a potential danger during labor in a subsequent pregnancy.

It goes without saying that the ultra-conservative, palliative methods do not cure the patient permanently and for that reason alone should not be used except as a temporary expedient.

The dry copper, zinc or mercury amalgam ionization methods have the following disadvantages: The cervical mucosa adheres to the electrode and bleeds when the electrode is withdrawn, even though the polarity be reversed at the end of the treatment; the straight rod shaped electrode most frequently used does not fit the fusiform shaped cervical canal, thus concentrating the current at the ends of the canal; it does not take care of the erosion and cysts if present; the time necessary for a cure is longer.

As cervical erosion and endocervicitis occur most often in women during the childbearing period and as the majority of these patients are seen by the family physician, the need of a safe, simple and effective method that may be used by the general practitioner becomes apparent. My experience has shown that the extreme radical methods are not necessary for the ordinary cases of endocervicitis and cervical erosion. I have found that the combined coagulation and irrigating ionization method described above does away with most of the undesirable features of these methods and gives uniformly good results.

Coagulation of the eroded cervix and destruction of the nabothian follicles are entirely painless so that no anesthetic, local or general, is needed. The possibility of hemorrhage when the slough separates is remote; in fact, a third of the vaginal portion of the cervix may be coagulated without reaching large enough blood vessels to cause alarming hemorrhage. This method may therefore be safely used for plastic repair of a lacerated cervix resulting in a perfectly normal, soft cervix without any scars or danger of causing dystocia in case of subsequent pregnancy. And as the germicidal or bacteriostatic effect of the copper, zinc or mercury ions driven in by the anode of the galvanic current is sufficient to remove the pathologic process of the cervical canal, it is certainly not necessary to use a more drastic and painful method. The cleansing action of the two gallons of antiseptic solution washing the cervix and the vagina, and the supply of fresh ions to the

mucous membrane seem to be the factors in shortening the time necessary for a complete cure.

The constant pressure of the film of water separating the cervical mucosa from the electrode during the treatment prevents the sticking of the mucous lining to the instrument, so that there is no bleeding when the electrode is removed at the termination of the treatment. Finally, the technic of the method is so simple that the dexterity for its application may easily be acquired by the general practitioner, who sees the majority of cases of cervical erosion and endocervicitis.

It can thus be seen that the method of treatment given approaches the ideal, that is, it is painless, safe and rapid, there are no complications or untoward sequelae, the technic is simple, and the treatment interferes but little with the daily routine of the patient.

Results

A follow-up study in 180 of the 210 patients of this series showed complete relief of most of the troublesome local symptoms, such as leukorrhea, painful menstruation, dyspareunia, irregular uterine bleeding and bleeding after coitus. A few reported persistence of general symptoms, such as weakness, anorexia and insomnia, but to a lessened degree.

Only 12 cases had recurrences, but in each case it followed a pregnancy subsequent to the treatment, which indicates the definite relationship of parturition to erosions and endocervicitis.

Of 13 cases that came with the chief complaint of sterility, 8 became pregnant subsequent to the course of treatment and gave birth to healthy children.

Eight patients had a hysterectomy performed for uterine tumors subsequent to the cure of the erosions.

In 6 patients perineorrhaphy and ventral suspensions were done subsequent to the cure.

One patient died of pneumonia about one year after the completion of the treatment.

Two patients died of carcinoma of the breast, one 3 years and one 4 years after the treatment. One patient died of diabetes and pulmonary tuberculosis 10 years after the cure of the erosion. One patient died of scarlet fever during her puerperium.

The rest of the patients remained free of any symptoms referable to the pelvic organs.

I believe that in all cases operated on for various conditions, the clearing of the erosions and endocervicitis prior to the operations was a favorable factor in producing a complete cure.

Summary

1. An analysis of 210 cases of endocervicitis and cervical erosion with reference to age, number of pregnancies and duration is presented.

2. A simple description of the pathologic process and the symptoms is given.

3. Description is given of a new instrument and technic of a combination treatment of coagulation and special ionization.

4. The advantages and results of this method are described.

5. Differential diagnosis and contraindications are considered.

6. Stress is laid on the importance of early diagnosis and proper treatment of cervical erosions as a preventive measure against potential malignancy.

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PSYCHOLOGIC OBSERVATIONS WITH REEDUCATION IN A CASE OF MULTIPLE SCLEROSIS *

WALLACE MARSHALL, M.D.

APPLETON, WISCONSIN

My interest in reeducational procedures for patients with neurologic lesions began a few years ago with a study of patients who exhibited the Parkinsonian syndrome.[1] In that paper it was stated that some of the patients could be reeducated to perform simple tasks which they had apparently forgotten during their disability. Our method of treatment consisted mainly of psychotherapy, relaxation, and reeducation, with the aid of such adjuncts as physical therapy and occupational therapy. Several patients were reeducated sufficiently to allow them to reenter their places in society. A few of the sequelae, noted in these cases, were abolished sufficiently so that they did not hinder the patients from earning their livelihood.

We stressed the point that such patients had apparently primary organic lesions of the centers controlling associated movements and the powers of correlation. This point was developed in another paper.[2] It seemed that the residue of neurologic handicaps caused inability to perform routine tasks which the patients previously were able to do. Such movements were the swinging of the hands while walking with a normal stride, eating and walking, talking and gesticulating, and the like. In my first paper it was pointed out that reeducational procedures apparently taught these individuals to resume the lost movements and to regain their correlations.

In a recent communication, Ferguson and I[3] described the treatment of a case of alexia in which these reeducation procedures were applied with emphasis on the substitution of the normal auditory tracts and their corresponding centers for the malfunctioning visual centers, which did not seem to be able to retain nervous impulses. This process of reeducation is based upon the ability to reteach an individual to get through the intact pathways to the related brain structures where these impulses apparently are interpreted. In other words, this consists of a substitution process in that the brain is put in touch with the individual's environment by the substitution of a normal pathway and corresponding brain center over a defective one.

Of interest is the consideration of phenomena which have to do with the physiology of the peripheral mechanism of sense. Bronk[4] has described the recording of action potentials in single sensory nerve fibers in order to intercept the sensory messages from the individual receptors, so that the nature of the nervous effects themselves could be adequately studied. A characteristic sensory nerve impulse is thought to be composed of a train of impulses which follow one another at a definite frequency. Bronk called attention to the variables which seem to be associated with this phenomenon. These variables consist of the number of sense organs in action and the frequency of the impulses from the single receptor. Attention is called to the fact of the stronger the stimulus, the greater is the number of stimulated receptors, since numbers of other receptors are brought into action, due to their higher threshold. Furthermore, the stronger the stimulus, the higher the frequency of discharge will be from the individual receptor. Time is a factor for consideration, and the frequency of discharge gradually wanes. This seems to follow the usual lines of summation which one meets in the study of physiology. One can summarize these state-

* From the Appleton Clinic, Appleton, Wisconsin.
* Read before the Missouri-Kansas Neuro-Psychiatric Association, Kansas City, Missouri, Feb. 15, 1939.

ments by saying that the intensity of sensation is, generally speaking, a function of the total number of the afferent impulses which go to the associated centers.

Bronk[3] described a further point in question when he stated —

> If these sensory nerve messages from various sense organs are all of essentially the same general character, the very important question arises as to what is the afferent basis for different qualities of sensation. There are, it is true, certain important differences in the nervous discharge from different types of receptors. For instance, the tactile receptors adopt very much more quickly to a constant stimulus than do the photo receptors of the eye. Nerve impulses coming from different types of receptors have somewhat different time constants, and the threshold of different sense organs is quite different from the various types of stimuli, as is shown, for example, by the fact that some photo receptors are very much more easily stimulated by certain wave lengths of light than are others. But probably the most important factor in this matter of discrimination of qualities is where in the central nervous system the afferent impulses finally end. Because of this consideration one must assume that the whole pathway is involved in determining the character of the results.

It seems evident that most of the receptor systems and their corresponding afferent pathways become rather important when reeducational procedures are employed in reteaching neurologically handicapped individuals.

It is interesting to note that some work has been done on this subject by the various staff members of the Neurological Hospital of New York on the reeducation of patients with various types of paralysis.

Of interest also is the work of Maria Montessori, who founded the now famous Montessori kindergartens. She began her work forty years ago with the study of cretins and morons in a psychiatric clinic in Rome, Italy. Her work consisted mainly of teaching children by sense perception and by directing rather than controlling their activity. Her theory had it that if a child could touch something tangible with his hands, his brain would respond. In other words, she preached the doctrine of auto-education and sense training, which according to many of our modern educators seems to be most practical and worthwhile.

Then again one cannot overlook the remarkable state of education which Helen Keller obtained for herself by the sense of touch. Although she lacked the usual avenues for perception her sense of touch became so acute as to practically compensate for her other perceptual disabilities.

This process of substituting an intact perceptual system to take the place of a defective one is employed successfully in the reeducation of the blind by the Braille system. The teaching of the deaf is based on a similar theory.

It is interesting to observe, even in so-called normal cases, that some individuals possess apparently a greater ability to perceive through their visual tracts than they do through the auditory perceptual mechanisms. In other words, some children learn more rapidly through that which they read rather than that which they hear, for instance through the medium of a lecture. In other cases conditions are the reverse.

I do not have any reasonable explanation for these observations, nor do I know if the environmental set-up or the inherent neurologic ability of an individual would reveal the exact cause of this condition. Nevertheless, this state of individual differences has been of interest to me for some time.

Since the prognosis of multiple sclerosis is not particularly hopeful, in that the symptoms tend to become more pronounced with the progress of time, it has been my desire to observe the course of events which might present itself if reeducational procedures, as stated above, were instituted.

Although our present findings are most incomplete and indecisive, they appear to be rather interesting, and for that reason alone I would like to present them for your consideration.

Case Study

The present case came to our attention about three months ago since an associate was acquainted with our desire to investigate this subject of reeducation. The patient, R. L., age 69, a white female, had consulted the neurologic section of a well known clinic on November 5, 1930. Her history of past illnesses was rather inessential, and the family history was negative, except that the patient and a sister had developed a scoliosis at an early age. At the time of examination in the above mentioned clinic she complained of difficulty in walking and dizziness. She was found to be well developed and well nourished. Her systolic blood pressure was 140, and the diastolic 90. The general physical examination, apart from the present complaint, was essentially negative. The urinalysis was negative as were the findings of the blood count.

An eye examination showed vision in the right of 6/7; of the left 6/15; the pupils were irregular and reacted normally; the perimetric fields showed no change in the color or form field. The ophthalmoscopic examination of her fundus showed a pallor of the left disc, and also to a lesser degree of the temporal part of the right optic disc. The ophthalmologist was of the opinion that some time or other the patient had suffered from a retrobulbar neuritis on the left side.

X-rays taken of the chest showed a scoliosis of the dorsal spine, and a slight calcification of the aortic arch. X-ray of the heart was normal.

An electrocardiogram showed a rate of 71, sinus rhythm, a right ventricular preponderance with an inverted T wave in derivation III. There was an exaggerated P wave in derivation II, and a slurred QRS in derivation III. From the neurologic examination she exhibited a slight horizontal nystagmus. The eye movements, however, were slow and difficult to perform. There was a very definite disturbance of speech and she had an unsteady gait with a certain degree of spasticity in it. The tendon reflexes were exaggerated throughout. The abdominal reflexes were absent. There was a marked incoordination of the movements of her hands and lower extremities, more marked on the left side.

Her memory and attention were rather diminished, and there was some lability of her emotions. The spinal fluid examination was essentially negative throughout, as was the Wassermann examination. Taking into consideration the changes in the optic nerve, her ataxia, speech difficulty, and spasticity of the lower extremities, it was impossible to avoid the conclusion that this case had a diffuse or disseminated sclerosis of the nervous system. The physicians who attended her felt that the disease was a multiple sclerosis in spite of her age, and that the condition could be classified as a disseminated inflammatory process in the nervous system, and also that it might be placed under the heading of disseminated encephalomyelitis. They felt that this disease presented a rather bad prognosis and that the patient would continue to get worse in the same way that she had gone in the past.

They advised the use of sodium cacodylate for a period of six weeks, given intramuscularly.

The patient presented essentially the same findings as were noted previously upon our examination, and through further questioning we obtained a history of a fractured femur of the left leg which apparently healed without any complication within the course of three-quarters of a year. This accident occurred one year after she had visited the above unnamed clinic.

Therapeutic Exercise

We began our work with routine exercises which consisted of the following:

1. Placing the arms over the head.

2. Bending forward and touching the metatarsal arches, if possible, with both hands.

3. Raising of the right knee without support of the right hand on the chair while seated.

4. Raising of the left knee to the same height as the right.

5. Obtaining an equal amount of flexation and extension in the left and right knee through a backward and forward motion.

6. Raising the right limb and placing it over the left knee with controlled return to normal position. (Same with left knee.) This exercise is employed to effect control and to give a natural feeling of the lower extremities to the patient. This exercise enables the patient to obtain a proprioceptive sense of the position of the feet to the extent that she will have better control when taking steps.

7. Bending while standing and supporting herself at the foot of the bed.

8. Squatting and shifting balance with either the right or left arm for the purpose of clarifying and aiding a deficient sense of balance when taking steps. Prior to any attempts at walking the patient's attention is called first to correct posture and foot placement while seated, after which concentration on equal balance is insisted upon to effect erect standing. When patient determines that she has definitely a sense of balance, walking is attempted, after which concentration is emphasized for the purpose of obtaining equi-distant steps for the maintenance of balanced stance.

Active work of a reeducational nature was begun on the 16th of January, 1939, and a lack of correlation between the sensory and motor neurons appeared to be evident. The patient was unable to concentrate on any matters which were called to her attention. She could be taken from the bed to the chair and placed in it, where she would sit for hours and gaze out of the window, and she did not possess any ability to raise herself from the chair. Her physical features showed a rather appalling lack of interest in her surroundings and one received the impression that her spirit had been crushed by the dark future which faced her. She was unable to flex her left knee, she had no control over the right foot and when she was held by the waist and pulled to a standing position, the entire left side of her body began to sag. She had no power to remain upright by herself. Her speech was scanning in nature. She had lost contact with her environment in that she did not even know, for some reason or other, the President of the United States, or the prominent political figures in Europe. There seemed to be an entire lack of proprioceptive sensation which pertained to the lower extremities. There was an apparent atrophy of the musculature which involved both lower extremities.

The first treatment lasted one hour and was comprised of an attempt at the above described exercises and general conversation. An explanation of concentration and of balance was given, but it was our opinion that the patient comprehended practically nothing of what was being explained.

The next treatment took place January 18, two days after the preceding session. Correlation was apparently still lacking, although the ability of concentration on the part of the patient seemed to have become mildly improved. No increased flexation of the left knee was evident. A marked weakness of the left portion of the body, the lower back, and the knees was quite evident. This was noted particularly when the technician attempted to have the patient stand with the aid of his support. The patient exhibited a tremendous fear of falling which was combined with a great amount of anxiousness, in that she expressed a wish to walk again. This resulted in a conflict, and consequently very little progress was made in the ability to take measured steps. These movements were most uneven, and there did not seem to be very much evidence of any control on her part as to knowing where her feet were. Various members of the family (mother

and sister) had complicated our set-up, since they could not be excluded very tactfully from the scene. The patient became rather agitated and could not concentrate on suggestions which were given to her by the technician.

The third treatment was administered January 20, which was a lapse of another day. It was noted that correlation and concentration did show some improvement. The ability to flex and to raise the left knee was of particular note. When the patient was made to stand with support of the technician, she exhibited a better balance, but there was a very evident weakness of the lower back and knees, which caused her to sag, especially on the left side. Suggestion was used in an attempt to get her in the proper psychologic mood for improvement to take place, and when an attempt at walking met with no success, and when a member of the family made her entrance offering a rather depressing comment, it was utterly out of the question to do anything at that time which would be of help.

Two days elapsed between the third and the fourth treatment, which was given January 23. The patient complained of a very restless night, stating that she could not exercise properly due to the interference which was brought about by the family. She was rather irritated and exhibited marked tremor whenever the technician attempted to give her any exercises. This treatment lasted only a half hour.

However, the next day, January 24, the technician had the patient go through her exercises with the result that commands were executed rather nicely and correlation seemed to have improved along with flexion of the left knee. Her stance was better and she seemed to be able to balance herself better. Walking was attempted with the result that she took eight steps which were all well spaced. The patient's attention was then placed on body posture, and the position of the lower extremities. All commands were executed rather nicely.

The sixth treatment, given January 26, revealed that she could flex and raise both knees to an equal plane. There appeared to be less evidence of body sag, and marked improvement in correlation was noted. But now again, a sister entered the room whereupon the patient became rather irritated and could not overcome the nervous tension that resulted from this conflict. Upon checking the patient's mental handicap, she reverted to her old inability to perform any commands whatsoever.

The seventh treatment, given January 28, showed that the patient reacted well from a neuro-muscular point of view, in that both lower extremities responded readily. It was evident that she was taking less time from the moment commands were given to her until the movements were actually executed. In other words, the lapse of time between the sensory and motor neuron was generally becoming improved. The technician conversed with the patient on matters other than her condition, and after this was carried on for about ten minutes, she was given exercises, which were executed fairly well.

With the eighth treatment, administered January 30, occupational therapy was employed, this consisting of needle work and stenciling. When the patient was put through her exercises, her concentrational abilities seemed to have improved, and she actually showed an interest in wishing to know the position of her lower extremities, and gave attention to her posture. She placed the lower extremities for the first time in their proper position without a command from the technician. Better control of the feet while taking steps was noted. Emphasis was placed on spacing the gait and taking shorter steps, which seemed to give her a better sense of balance and decrease the tremor, since it was felt that she was losing the fear of falling. The attitude of the family seemed to have improved somewhat for they were refraining from uttering any derogatory remarks which concerned the patient's condition.

The ninth treatment, given February 1, proved to be the exact opposite of the preceding one, since the patient was utterly unable to correlate her thought processes with muscular action. A marked degree of stiffness in the lumbar region and also a weakness and stiffness of the entire left side was very evident; consequently she was unable to take a single step. The technician concentrated upon the exercises, which were done with diminished agility.

The tenth treatment, given February 3, found her quite overanxious to begin treatment. She was so eager to execute a particular command that she did not give much attention to concentration, that is, to what was being asked of her. There was not much correlation between hearing a command and doing it. The subject of occupational therapy was stressed for some time, and then the patient was subjected to the exercises which were repeated and executed much better. Gratifying results were noted in right and left arm stance, no evidence of any great weakness appearing on the left side of the body, and she did not exhibit any tendency to sag in that direction. She was allowed to effect her own stance and volunteered when she felt that she was becoming unbalanced. She was able to take twelve steps, which were equally spaced. However, at this point her attention was distracted because of the entrance of her sister. The patient became excited and showed a strong inability to concentrate and to effect proper muscle movements. The walking procedure was repeated, but proved to be ineffective, due in all probability to physical fatigue. This seemed to provide further evidence of the necessity of rest periods between exercises, and those which involved concentration.

The eleventh treatment, February 6, showed that thought correlation was performed rather satisfactorily, but there was evidence of stiffness in the back and limbs with poor control over the lower extremities. Attention to position of lower extremities, was, however, very acute, and ability to raise limbs showed marked progress, but there was no evidence of any control in lowering them without dropping, due to a lack of muscular coordination. Her general condition was not as bright, nor comprehension as keen, as there had been no opportunity to do any occupational therapy work, due to too much company, which had been a contributory factor for two days. There was evidence of marked weakness of the left side when attempting to stand, which may have been due to general conditions and a lapse of two days rather than one between treatments. The right arm stance showed no evidence of weakness; however, the left arm stance showed marked weakness which produced body sag to the left. Walking ability was much better, but there was a weakness of the left side which tended to make the placing of the right foot difficult, in that she dragged the right foot due to the inability of putting proper weight on the left side. However, she did succeed, with two rest periods, in taking better than thirty steps. Generally speaking, there was evidence of lack of exercise and too great a length of time between treatments, resulting in a poor functional beginning and a marked increase in the lack of physical reserve.

Our observations on this patient, although they are far from complete or controlled, would suggest that there seems to be evidence of improvement when such therapeutic measures as stated above are employed. It is hoped that other colleagues will find opportunity to study such cases with the idea in mind that the poor prognosis regarding multiple sclerosis such as we have today, may be changed somewhat by such a method as I have tried to outline.*

References

1. Marshall, W.: The Psychopathology and Treatment of the Parkinsonian Syndrome and Other Post-Encephalitic Sequelae, J. Nerv. & Ment. Dis. **84:27** (July) 1936.

* I wish to acknowledge the therapeutic assistance which was given by Mr. LeRoy A. Hughes, my technician.

2. ————, and Marshall, V. F.: Traumatism and Parkinsonismus, J. M. A. Alabama **6**:358 (May) 1937.
3. ————, and Ferguson, J.: Hereditary Word Blindness As Defect of Selective Association, With Case Report, J. Nerv. & Ment. Dis. **89**:164 (Feb.) 1939.
4. Bronk, D. W.: Nerve Messages from Sense Organs, Arch. Ophthal. **13**:1115, 1935.

Spa Therapy in Rheumatic Diseases — Smith and Lutterloh

(Continued from page 143)

that the management of all the bathing places is under the direct control of a sympathetic yet energetic government agency, the National Park Service of the United States Department of the Interior, and that the agency is acting hand in hand with the local medical profession, the Hot Springs County Medical Society. Admission of physicians to practice at Hot Springs is under fairly strict scrutiny and there is real co-operation for the furtherance of the treatment purposes of the spa. All this redounds to the welfare of patients.

Dr. Smith and Dr. McClellan in their modesty, did not mention that they both are now members of a committee recently appointed by the American Medical Association, the Committee on Health Resorts. This is the first organized effort by the American medical profession of which, of course, the American Medical Association is the organized expression, to have American spas come under the scrutiny of the medical profession and promote their scientific use by the public and the profession generally. This important development cannot help but have a very valuable and salutory effect on the future of spa therapy and result in its more extended and more scientific use in that very large group of chronic conditions known as rheumatic diseases.

Dr. Euclid M. Smith (closing): With reference to Dr. McClellan's question regarding the cooling of the water, that is a mechanical problem of which I know nothing. It is handled by the engineers of the Park Service. But judging from my slight acquaintance with some of the men in the field, it is a definite problem, because the water has to be cooled without exposing it too long to the air. It has to be delivered to the bathhouse in its natural state at a cooler temperature.

I regret that this paper did not offer a series of cases that have been treated at Hot Springs National Park, but the time allotted to me and the fact that we had to cover a great deal of fundamental information in that short time prevented discussion of a statistical nature.

In regard to the elevation of the temperature that we mentioned, I confess that I do not know why that is. Some of our men think that it is due to the radio-activity of the water; some believe it is due to some other property. It may be, as Dr. McClellan has stated, that by surrounding the body with a fluid medium the evaporation of heat is interfered with, and that perhaps explains why the temperature goes above normal.

In regard to the question mentioned in the paper of the temperature being higher — that is, the temperature surrounding the patient — I feel that is due to some property of the water.

I appreciate Dr. Carroll's desire to know, and have his opinions based on research rather than belief. The Council on Physical Therapy of the American Medical Association has made a definite statement in this direction, and I feel that under proper supervision distinct benefits can be attained. We are convinced that the future of spa therapy in America is just beginning.

NEWER METHOD OF PHYSICAL THERAPY IN COMPLICATIONS OF DIABETES *

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PHILADELPHIA

It is my aim briefly to discuss the applications of newer methods of physical therapy in certain diabetic complications. For this purpose it is essential to review the pathology of certain complications of diabetes mellitus, which would seem suitable conditions for various physical procedures and to outline the methods which we have found to be of clinical value.

The most common complication of diabetes is the arteriosclerotic lesions of the lower extremities, a complication in which physical agents seem to be of great help. After considering the pathology of this condition, it will be seen that nature has already initiated healing process of aid to physical therapy.

Peripheral vascular diseases in the diabetic occur, as is well known, not because of the height of the blood sugar but because of certain arterial changes which have taken place over a period of years mostly, we feel, due to a lack of proper control of the diabetes or possibly to improper diet. It is of interest to quote Shields Warren's statement made in 1930 during the period of low carbohydrate-low fat diets:

> I have yet to see at autopsy a diabetic or to read the autopsy protocol of a diabetic, whose disease has lasted five years or more, free from arteriosclerosis, regardless of age. However, I hasten to add with real pleasure that I have never performed a post-mortem examination on a young person who had diabetes five years or more with insulin treatment throughout the course of the disease. Such cases rarely die of their diabetes.

The arterial changes one sees in diabetic patients are of two types. The first change is in the medial coat of the arteries, particularly the larger vessels in the so-called Monckeberg type of sclerosis which may result in the deposition of calcium salts in the medial coat of the artery. This can be easily visualized by x-ray. This type of sclerosis, of course, is not seen solely in diabetes, but may be present in the senile form of arteriosclerosis, and implies that the artery's elasticity has been lost and with it the advantages of a pulsating artery to the extremities. However, this does not mean that there has been any change in the lumen of the artery or that the blood supply to the foot is seriously diminished. The other type of arterial change results in a marked thickening of the intima, usually with a deposit of lipoids, and if this occurs in the smaller vessels it may be said to be almost pathognomonic of diabetes. With this intimal thickening, which as we shall show later, involves almost the entire lumen of the artery in extreme cases, there is a gradual diminution of the blood flow through the affected vessel. As this occlusion slowly develops, there arises a tendency to establish collateral circulation to take care of the blood supply to the extremity. During this development period these patients frequently complain of intermittent claudication on exertion which, once the collateral circulation has been established, is much less noticeable. From the studies conducted by Dr. Henderson on my services at the Graduate Hospital, Presbyterian and Abington Memorial Hospitals, he has definitely shown that this intimal change is segmental and usually does not involve the entire length of the artery.

* Read at the Eastern Sectional Meeting of the American Congress of Physical Therapy, Philadelphia, April 22, 1939.

From this, it is obvious that one who has had diabetes long enough to develop these changes has already been aided by nature in the development of a somewhat sufficient collateral blood supply which, in the absence of injury or trauma to the foot, may carry him through without any serious trouble. The final vascular lesion which produces gangrene in arteriosclerosis is usually different from that in diabetes. In arteriosclerosis embolic or acute obstructive phenomena usually take place and the resulting gangrene is limited to the part supplied by the involved vessel (e. g. a single toe). As this is rather sudden in its development, it is obvious that nature has not had a chance to establish a collateral circulation and that our efforts here must be directed at attempting to localize this lesion so that spontaneous demarcation may take place. In diabetes on the other hand, occlusion of most of the larger vessels has already taken place and the patient is just about getting by on a collateral and, at times, a very superficial circulation. A foot of this sort is a very vulnerable part, and gangrene results from external injury as a precipitating factor rather than from internal vascular changes, for in cases that we have studied it is obvious that many patients with diabetes have had, from time to time, occlusion of some of the smaller vessels without gangrene developing.

It has been said that 90 per cent of the cases of diabetic gangrene are preventable by proper education of the patient and care of his extremities. The most common causes we have found in precipitating gangrene are: first, burns from hot water bottles and electric pads; second, injury to the foot from cutting corns; third, wearing of ill fitting shoes or stockings; fourth, external trauma, such as stubbing the toes or dropping some heavy object on the foot; fifth, and in our experience the most common precipitating cause, the presence of epidermophytosis.

We have been interested in studying, by x-ray, the circulation of the extremity in normal, arteriosclerotic and diabetic individuals. Starting with what amounts to practically no collateral circulation, the young male adult has a fairly active group of what we look upon as the small blood vessels to carry the blood supply of the leg. But as the years go on these are less actively engaged in the circulatory maintenance and, except when called upon by the patient to keep the leg alive, are apparently of little use in the elderly individual.

Etiologic Factors

Arteriosclerosis develops ten to fifteen years earlier in diabetes than in other conditions, and there are certain etiologic factors which are thought to be active in producing this condition. Possibly the most important is the presence of hypercholesterolemia and increased blood fat which favors the deposition of the cholesterol products in the arterial wall. This condition is present in poorly and uncontrolled diabetes or when the disease is so mild that it may not be recognized for some time. It is in these groups that the largest number of gangrene of the extremities is found. It is quite possible that the earlier diets used in the treatment, which were basically low carbohydrate and high fat, tended to create a similar condition, so that while the blood sugar was satisfactorily controlled, hypercholesteremia resulting from the higher fat intake produced progressive vascular damage. Rabinowitz has clearly shown in a group of cases followed over a period of five years that patients with high cholesterol and normal blood sugar showed, at the end of this period, more definite arterial damage than did a similar age group in which the cholesterol was kept within normal limits. It is true that with the use of high carbohydrate and low fat diet, and with careful

attention to the level of the blood cholesterol in these patients we are seeing less arteriosclerosis. The first group of patients I have mentioned will continue to be with us until such a time as a well planned educational program, directed at the laity and the profession, results in the early recognition of diabetes and careful control of these cases.

Until this ideal situation exists many diabetics when first reporting for treatments have already developed arterial changes which are in all probability not reversible in spite of careful supervision of the diet. As diabetic coma is at the present time a complication of minor importance, the vascular complications present themselves as the most important and serious ones, and an overwhelming majority of deaths due to diabetes at the present time are ascribable to arteriosclerotic complications.

Indications of Physical Therapy

I would like briefly to review the complications, arterial and otherwise, in which we have found physical therapy of great aid, and to indicate the underlying pathologic conditions and the physical methods we have used. I am going to arbitrarily divide the diabetic patients in whom we use physical therapy into two large groups. The first, those with peripheral vascular symptoms and the second, those with complications elsewhere in the body. The first group obviously divides itself into several subdivisions:

A. Patients who complain of intermittent claudication, numbness, and coldness of the feet either with or without small gangrenous lesions. In these we suspect the underlying pathology above discussed, and anticipate that the collateral circulation will be improved to take care of the obvious circulatory deficiency. In this type of case we have used the following routine:

1. Hypertonic saline solution injected intravenously.
2. Buerger's exercises taught the patient while in the hospital and followed at home.
3. Positive and negative pressure. We have used both the pressure boot and the Collens-Wilensky apparatus, and while our experience with the latter has been more limited than with the boot, we feel that it offers no advantages and indeed, seems to give not quite as good results as did the positive and negative pressure boot. It is thought that the sinusoidal change of pressure which is advocated by Herrmann and Reed is a better type than the sudden pressure change used by Landis. The boot therapy is usually preceded by applying heat and massage to the leg, or by using a whirlpool bath with a temperature of 101 F. for an hour. We suspect that we get some results by using an electric pad muff during the treatment.
4. Diathermy, either long or short wave, to stimulate the circulation.

B. Cases with evidences of poor circulation and definite indolent ulcers.

1. Hypertonic saline solution intravenously.
2. High vitamin intake.
3. Whirlpool bath.
4. Positive and negative pressure boot.
5. Betacholine by ionization according to Joseph Kovacs' method, and in certain cases hypodermically.
6. Ultraviolet to stimulate granulation. We have frequently used ultraviolet for this purpose and, if carefully used, has proved to be a great help. We certainly see no contraindication to its use in diabetes.
7. Thermostatic cradle with calcium chloride or some other dehydrating agent.

C. Cases with frank gangrene and cellulitis. These have the same underlying vascular pathology as those stated above, but gangrene has de-

veloped and with it cellulitis or even thrombophlebitis of the superficial tissues. We do not use physical therapy in these cases except ultraviolet or some form of heat. In the presence of infection any treatment with the positive and negative pressure boot or intermittent occlusion should not be used. In addition to actual infection, it is also unwise to use boots on both legs simultaneously because of possible cardiac complications. Much good can be accomplished with low as well as higher pressure. Our applications average 60 to 70 negative and 30 to 40 positive pressure variations. It is hardly necessary to point out that these boots cannot resurrect a dead leg, and that it should be used with care. Those who have seen feet with relatively small areas of gangrene on the surface, but the entire subcutaneous tissue a necrotic and gelatinous mass, realize that no procedure is of any use in these cases.

D. Embolic gangrene is not common in diabetes, but we have had eight patients, one of whom had three popliteal occlusions at various times. In addition to the usual medical treatment we have used the boot almost continuously for the first twenty-four hours, then four to eight hours on subsequent days, and to date had no gangrene developing in individuals seen within the first twenty-four hours.

The second group involves diabetic complications other than those of the extremity:

A. Postoperative cases. If there is an open or granulating area we have advised the use of ultraviolet to stimulate healing. It is important to remember that patients when lying in bed subsequent to operation have a slowing of the metabolism, thus a slowing up of carbohydrate utilization, so that they do much better if passive exercise is instituted and tonic ultraviolet is given. Any diabetic patient particularly after amputation, must remain in bed a for a long time and a readjustment in the diet and insulin must take place unless care is taken to obtain the full result of muscular effort in their metabolism.

B. Carbuncles. We have been interested lately in treating certain carbuncles with hexamethylene intravenously and with this have found it of value to use locally water cooled ultraviolet. Very often by use of this method, extensive surgical intervention may often be avoided. I would like to add a word in regard to the evaluation of the vascular condition of the extremity. We feel that in most cases it is quite possible to obtain enough information for a satisfactory clinical diagnosis and indication for treatment by simply observing color changes in the foot, the gross temperature changes to touch and the presence or absence of pulsation. The newer requirements in vascular diagnosis are certainly of interest and in some cases of extreme importance, but as they are not always available the more simple procedures are quite adequate for clinical appraisal.

Conclusion

Physical therapy is of great aid in helping to control diabetic complications which will continue to arise regardless of causative factors. Physical therapy affords patients more comfort, and avoids in many instances major surgical procedures.

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.·. EDITORIALS .·.

IMPORTANT ADVANCES IN IONTOPHORESIS

When more than a century ago Sir Humphrey Davy advocated the introduction of certain medicinal substances into the human body by means of voltaic batteries, the first workers could not possibly forsee that ionto- or electrophoresis would in the course of time become an extremely important therapeutic measure. Even up to recently the majority of the medical profession interested in this form of therapy had no reason to regard it with confidence, since reported failures had brought about definite prejudices against the method initiated by the pioneers. As often has happened in the history of medicine, in spite of antagonism and certain reservations, this method once rejected was taken up again, thoroughly investigated and its value established on a rational basis, due to the fundamental research contributed by Faraday, van't Hoff, Clausius, Arrhenius, and others.[1] At that it required more than a century before certain of the medical profession developed sufficient confidence to restore this procedure for certain clinical indications.

During the past decade there arose what may be termed a renaissance of the utilization of medical as well as surgical transfer of ions into the system by the direct current. This was made possible by the development of electrophysics and electrophysiology which dissipated the mist of prejudices based on lack of information. Being better informed the profession was in a position to accept the new theories of electrophoresis. Thus the use of histamine for its vasodilating action in connection with rheumatic disease, of certain metals and inorganic salts for quasi surgical applications especially in otorhinology, has become recognized as valuable if not potent adjuncts by those who have mastered the proper technics.

In a chronologic sense it is interesting to note that during the past decade the development of the procedure has resulted in the widespread utilization of histamine and then mecholyl iontophoresis, not only for the protean type of rheumatic disease but for a large number of inflammatory infections characterized by the pain syndrome. At the same time it must be pointed out that a considerable number of drugs have been recommended in the literature as suitable for electrophoretic incorporation without having met with general acceptance. This may in part be due to the ease with which the physician can administer these drugs by oral or hypodermic methods and again to a failure to realize the greater effectiveness of ionization. It is conceded that in many instances the customary way of medication is adequate, but there are many others in which the usual route produces only effects that are ephemeral as compared with those following electrophoretic transfer of medicinal ions. For illustration we need only compare the effect of histamine administered subcutaneously. It will manifest itself in the characteristic manner by the production of erythema, vasodilatation, reduction of blood pressure and relief of pain, a reaction identical with that obtained by ionization but with this difference: the former is exceedingly short in duration and the latter more enduring. Again, potent drugs of which these vasodepressors (histamine and mecholyl) are examples, when once in-

troduced by injection may cause untoward effects which can be combated by proper countermeasures; but with iontophoresis the complications though rare may be checked by the simple measure of stopping treatment. All this has been substantiated by those who have initiated this form of therapy; namely, Deutsch,[2] Joseph Kovács,[3] Kling,[4] and others.

Within the last year two important advances have been recorded which merit acceptance by the general medical profession. The first pertains to the diagnosis and co-seasonal treatment of hay fever by electrophoresis of the active constituent of ragweed extract. Abramson[5] of New York, conceived that this extract would produce local skin deposits such as are seen with histamine, but observed no such topical effects in a number of cases. However, he did observe mild constitutional reactions which could be increased or decreased by varying the parameters of electrode area, intensity of current, and concentration of the solution. The solution used by him was an especially prepared dialyzed extract of giant ragweed containing 0.07 mg. total nitrogen per cubic centimeter. In this connection it is of interest to note that the positive pole is more efficient in introducing giant ragweed extract while the negative pole seems to be more effective for the introduction of short ragweed extract. This finding is particularly valuable because both poles are placed on the forearm or thigh and can be utilized to introduce at one and the same time both types of extracts.

Following Abramson's observations, Dutton[6] undertook a series of experiments for the purpose of obtaining allergen tests by ionic transmission with the conventional glycerol saline extract. Eight or ten allergens were used at each session and he found that positive pollen tests were readily obtained. By changing the dosage for the purpose of delivering electric densities to a number of small areas, Dutton found this procedure effective also in allergic tests for dust and foods, all of which shows that by modifications of the suggested technic virtually a new field in allergic diagnosis has been opened.

At a recent meeting of the Midwestern Section of the Congress held at Minneapolis on March 7, Kobak[7] reported an original method of controlling certain grave types of muscular contractions and spasms by the electrophoretic introduction of magnesium ions which promises far reaching future possibilities. At the Cook County Hospital where several patients suffering from the after effects of traumatic lesions of the spinal cord had resisted the entire gamut of physical and other measures for many months, Hummon suggested a trial with magnesium salts on the basis of their known analgesic action on the parasympathetic nervous system. These patients responded in such a dramatic manner that the procedure was extended to include a comparatively large number of patients who suffered from urinary retention subsequent to abdominal operations. At least 50 per cent of these patients were not benefited by the administration of prostigmin ordered routinely, but responded almost immediately to a ten minute application of 10 ma. direct current applied as a close to the bladder as was possible. These repeated observations were so striking as to hold out the promise of duplication in other conditions of so-called idiopathic tetany, distention and perhaps in the many symptoms associated with vagospasm and myotonus, a field which can be entered by all interested in this important advance of iontophoresis.

In view of what has been stated it would seem evident that we are no longer concerned with hypotheses or empiric methods but with a measure on a scientific basis concretely demonstrated to possess great therapeutic value. It is a far cry from Davy's first proposal which unfortunately failed

to gain ground owing to the limited knowledge of the times, to the present era when the science of electrobiology has reached a stage of advance which has removed the shortcomings of the past and affords the practice of medicine another valuable measure for combating disease.

References

1. Bayliss, W. M.: Principles of General Physiology, Chap. III, V, 4th Ed. London, Longmans Green & Co., 1924.

2. Deutsch, Dezso: Histamin zur Therapie Rheumatischer Erkrankungen, Med. Klin. **27**:1491 (Oct. 9) 1931.

3. Kovács, Joseph: Iontophoresis of Acetyl-Beta-Methylcholine Chloride in Treatment of Chronic Arthritis and Peripheral Vascular Disease, Am. J. M. Sc. **188**:32 (July) 1934.

4. Kling, D. H.: Histamine Therapy of Rheumatic Affections and Disturbances of Peripheral Circulation, Ann. Surg. **99**:568 (April) 1934.

5. Abramson, H. A.: Electrophoresis in Hay Fever Therapy, New York State J. Med. **39**:1611 (Aug. 5) 1939.

6. Dutton, L. O.: An Ionic Transmission Method for Testing with Allergens, J. Allergy, **11**:2 (Jan.) 1940.

7. Kobak, Disraeli: Iontophoresis by Vasodilating and Vagotonic Drugs. Read at the Midwestern Sectional Meeting of the American Congress of Physical Therapy, Minneapolis, March 7, 1940. (To be published.)

IMPRESSIONS OF THE 1940 MIDWESTERN SESSION

On the morning of March 7, the terraced amphitheatre in Eustice Hall was filled by a select group of visiting physicians interspersed with faculty members, nurses, technicians and undergraduate students, who by their presence and especial interest unconsciously dedicated an event of historic interest in the annals of the Medical Department of the University of Minnesota in Minneapolis. This meeting represented the first official visit of the midwestern sectional group to this institution, and was the first official recognition rendered our national body by the second largest of American universities for its educational labors in behalf of scientific physical medicine. Acting in the capacity of unobstrusive host, the Medical Department of this illustrious state institution added formal approval to the efforts of the Congress, and no doubt largely was responsible for the solemn overtones, dignity and special glamour that pervaded the assembly.

The audience by its critical interest and attention formed in itself a provocative background. They and the scholastic, austere environment, constituted an intangible catalytic agent that made one not only forget inclement weather but created in the speakers an interest and enthusiasm that gave greater depth and precision to the problems evaluated. From the vantage of the theatre pit and through the especial lighting arrangement, the audience provided the essayists with a rare picture of a collective living body in motion and responsive emotion. The circular tiers slanting upward and lost in the recess of a dim ceiling were filled with a comfortably crowded group of mixed sexes and ages, whose color scheme of dress appeared to be a coalescing white contrasted with a nondescript of black, over whom hung a relief of faces and the noise of crinkling paper. One felt an emanation of unified interest that challenged even the most placid of speakers to a more acute response.

In contrast, the lighting and sonic arrangement of the pit gave the audience an equally eerie impression of the speaker as he was bathed under the glare of centered illumination, or fixed in outline from a bluish light radiating from the rostrum. In either instance the essayist was the focus of an

illuminating source that transfixed his presence in bold relief against a black background and made him the center of a narrowing group of terraces that circled downward in the shape of a gigantic funnel. Perfection of sound rendered the hall an ideal carrier of vocal qualities and nuances sufficient to center all attention to the picture of the expressed thought, rather than to the sound of the spoken word.

The nine topics selected for this sectional exposition represented a pertinent cross-section of what may today be considered as physical therapy in its most fundamental, progressive and scientific aspects. These embraced certain practical considerations of interest to every clinician and most specialists. They touched upon the values of the latest forms of thermotherapy by short wave diathermy and artificially induced hyperpyrexia. Molander paved the way for its clinical consideration by reviewing the pros and contras of its technical possibilities and limitations. Schmitt of Chicago presented his impressive experience of the advantages of short wave diathermy in pneumonia; Wahrer, Knapp and other speakers pointed out its clinical value and limitations in certain universally present syndromes associated with infections, inflammatory and traumatic maladies. Wahrer stressed the adjuvant value of heat and electrophoresis in inorganic disturbances of eye, ear, nose and throat and condemned those who are attempting to rely upon these measures as a new panacea in this division of practice. Knapp illustrated the place of physical therapy in fractures by demonstrating its synergistic value in relieving congestion and improving function by use of all the available measures practiced by experienced exponents of our discipline. In no other division of our healing art is physical therapy so universally applicable. Indeed, even the very nature of the surgical interference utilized — traction, tension, suspension and immobilization — is a form of special or artificially forced rest of a physical quality that plays a part in the healing of the bony structure to the same extent as does massage, motion and heat for restoration of function of the softer parts.

The known glamour and erudition of the Mayo Clinic no doubt exerted an especial drawing power upon a large percentage of physicians from the neighboring towns and states. They came, they heard and were properly impressed by the two splendid expositions from the Physical Therapy Division of this Clinic. It should be pointed out in frank admiration that nothing is done by the Rochester group in half measure. If one may be permitted to paraphrase a physiologic expression, it is the all or nothing law with them. Accordingly one saw the chief representative of this Division, Krusen, not only looming largely at rest surrounded by a streaming group of associates and white gowned nurses, but felt the audience rise to his restrained enthusiasm and earnestness when he cogently reviewed the treatment of fibrositis from the immediate perspective of its physical therapeutic possibilities. The address was a conservative but keen evaluation of one of the most neglected conditions in the rheumatic problem and was rounded out by suitable illustrations that brought home the value of physical measures in this rather obscure but widely prevalent disease. In contrast, Elkins' effacing style of delivery drove home with dramatic force the progress in fever therapy by the very power of an imposing clinical experience that included observations of the combined uses of sulfanilamide and extra high fever treatment for gonorrhea and its complications, brucellosis and other maladies at present found intractable to classic medication. It was no small compliment to these essayists to state that the most persistent interruption was the noise of pencil on paper by the fact-seeking visitors in the dimly lit amphitheatre.

Of the three remaining papers, each carried a message in the form of affirmation or confirmation that brought out old values and new findings, which added a new orientation to the procedures under consideration. Reviewing the progress and present status of iontophoresis, Kobak brought forth the comparison of this age-old practice to that of the gradual development of knowledge wherein the discovered truths became bound down by traditions and prejudices difficult to uproot. He pointed out that up to a decade ago the prejudices developed around iontophoresis made this procedure one associated with criticism despite the fact that its fundamentals are steeped in richest truths and traditions. He evaluated the benefits and limitations of histamine and mecholyl by means of their transfer by solutions and ointments. Kobak further pointed out new and promising uses of magnesium iontophoresis and its favorable action on atony and post-operative urinary retention, abdominal distention and relief of muscular spasm associated with trauma of the spinal cord.

Wyman's thesis was a plea for those arthritic patients best treated under institutional control other than the modern hospital. He presented the modern picture of what is commonly described as spa environment that caters to patients by all proved measures including physical and least by psychotherapeutic efforts. He outlined a program of treatment as conservative as it was instructive and no doubt will have a constructive influence on the group selected by the American Medical Association to study the spa situation in this country.

Completing the program, was the dinner in honor of the President, Dr. William H. Schmidt of Philadelphia, who as guest speaker delivered an oration on electrosurgery. The address was preceded by a friendly introduction of welcome by William A. O'Brien, Director of Post-Graduate Medical Education of the University of Minnesota, who also acted as toastmaster of the occasion. No better impression of the closing hours could be put down than to state that this session left the Midwestern Section imbued with a feeling that the progress of physical therapy is worthy of the recognition and warm support extended it by organized medicine and appreciative of the friendly spirit demonstrated by such an illustrious institution, the University of Minnesota, its most recent host.

(Special Article)

PHYSICAL THERAPY AND GRADUATE TEACHING AT UNIVERSITY OF MINNESOTA *

WILLIAM A. O'BRIEN, M.D.

Director, Department of Post-Graduate Medical Education University of Minneapolis

MINNEAPOLIS

The University of Minnesota is proud to be your host today.

The teaching of physical medicine has become a matter of increasing importance in medical education. About twenty years ago, we had large groups come to the campus to study the nature and therapeutic action of various apparatus that were then being introduced to create physiologic and clinical changes in the body. There was a great deal of discussion about psychic values, and boasts that neurotics would be handled in such a way that they would not be further endangered by "quacks." In the light of present knowledge it seems that exhorbitant claims were being made as to curative values.

The contrast today is apparent to all. I have just finished reading Dr. Knapp's remarks on the value of physical therapy in neurotic and psychic states in which I find that he dismisses it with but a few lines as a method of little value. Most of our medical schools are establishing departments of physical medicine and opportunities are provided for graduate study for physicians. With the rapid increase in chronic disabling diseases because of aging in our population, there will be an insistent demand for many well-trained physicians and their technical associates in this field. When our population was younger, and acute diseases were more interesting, those who suffered with chronic afflictions were managed very much as if they had acute illnesses. A search was made for cure when management of a self-limited, long-time disorder was indicated.

The University of Minnesota, through its Department of Post-Graduate Medical Education, is sponsoring at the Center for Continuation Study a series of courses in all the professional fields in order that gaps in training may be bridged and new developments brought to the attention of the practitioners. Approximately half our courses at the Center for Continuation Study are in the medical and hospital fields. During the past three years, 55 courses have been given with a registration of 1,999 persons. The course in Physical Therapy Technology which was completed last evening is an example of the kind of courses we are offering in the hospital field. There will be a course next week in General Surgery. All of our instruction is based upon the present day needs of those in the field. It appears to us that physicomedical methods are not so well known to physicians as they might be. We trust that we can help to change this state of affairs by continually or periodically emphasizing the advances in physical medicine.

The Center for Continuation Study was erected in 1936 at a cost of $330,000, to serve as an exclusive residence school building for professional groups. It contains living accommodations for 78 persons, study rooms, dining hall, lounge, and basement garage. It was the dream of the late President Lotus D. Coffman, who felt that American universities were not providing adequate opportunities for their graduates to return for further study. Most of our groups stay from three to six days. Their programs are planned in advance to meet their particular needs. The faculty is selected from

* Introductory remarks by Toastmaster Dr. William O'Brien at the Dinner Session of the Mid-Western Section of the American Congress of Physical Therapy, Minneapolis, March 7, 1940.

members of our staff or other institutions. The success of the venture indicates that a definite need is being satisfied.

Dean H. S. Diehl, who had planned to be here tonight, is himself a victim of a condition for which physical therapy is being used. He sends not only his regrets but also his gratitude for the aid and comfort he has received from the physicians in your field. We feel that when you again return to the campus that you will find physical medicine has made great forward strides in its applications to our patients' problems. We know that the representatives of physical medicine at the University of Minnesota Medical School and the Mayo Foundation will continue to represent your group as they have in the past in an ethical, scientific way.

SCIENCE, NEWS, COMMENTS

New York Physical Therapy Society

The New York Physical Therapy Society will hold its regular March meeting, March 13th, at 8:30 P.M., in the Faculty Room of the Polyclinic Hospital, 345 West 50th St., New York City. The speakers will be Drs. Sidney Licht and Willard Travell. The meeting is open to members only.

The Canadian and Ontario Dental Associations

The Annual Convention of The Canadian Dental Association and the Ontario Dental Association will be held at the Royal York Hotel, Toronto, Ontario, May 27, 28, 29, 1940. Dentists from the United States and from all parts of Canada will be welcome.

Expansion Military Service of Physical Therapy Technicians

At the request of the Surgeon-General of the Army and as an expansion of its peace-time service for the military forces, the American Red Cross has undertaken the enrollment of medical technologists who are willing to serve in the Medical Department of the Army or Navy if and when their services are required in a national emergency. Included in this enrollment will be physical therapy technicians (aides), men and women, who can meet certain technical and physical standards.

With the co-operation of the various registries and associations of medical technologists, all members are being asked to enroll with the Red Cross for this possible service with the military forces. If and when the services of those enrolled with the Red Cross are required, physical therapy technicians (aides) who qualify may be utilized by the Army or Navy, according to the following plan:

For the Army. — Women only, who meet the required standards, may be employed as civilians.

For the Navy. — 1. Men only. If and when the services of male physical therapy technicians (aides) are desired by the Navy, they will be enlisted in the Naval Reserve as Pharmacist's Mates, 1st, 2nd, or 3rd class, or Chief Pharmacist's Mate (acting appointment) to be determined by the District Commandant on the basis of the individual's qualifications. 2. Notwithstanding the maintenance of this enrollment for a possible national emergency, the Navy also desires peace-time enlistment in the U. S. Naval Reserve, and Male physical therapy technicians (aides) who wish to enlist therein should communicate directly with the Commandant of the Naval District in which they reside. The address of their Commandant will be furnished by the Red Cross upon request.

General qualifications for enrollment are as follows:

1. Citizens of the United States. 2. Ages 21-45 years (Army); 18-35 (Navy). 3. Applicants must pass a satisfactory physical examination before enrollment. It should be understood that all applicants who are accepted for enrollment will be required to pass another physical examination given by the Army or Navy at the time their services are utilized. 4. Women applicants must be unmarried. 5. Each applicant must express a willingness to serve as a technologist in the event of a national emergency.

Special and technical requirements for physical therapy technicians (aides) are given in the following statement. If you meet the necessary qualifications as stated herein and are interested in the medical phases of military service will you indicate your desire to enroll by writing to National Headquarters, American Red Cross, Washington, D. C., for the necessary forms.

Requirements for registration:

1. Men or unmarried women.
2. Education and experience:
   a. Graduation from an accredited high school or its equivalent.

b. (1) Graduation from a course of Physical Therapy of not less than nine months duration, from a school approved by the Council of Medical Education and Hospitals of the American Medical Association following:

(a) Graduation from a four year course in Physical Education, or a four year college or university course with a major in Physical Education, *or*

(b) Graduation from a school of nursing recognized by law in the individual states, *or*

(c) Sixty college semester hours, including courses in physics, chemistry and biology.

or (2) Equivalent education prior to 1936, which is the date of the publication of the list of courses approved by the Council of Medical Education and Hospitals.

c. One year's practice in Physical Therapy within two years of graduation from the school of Physical Therapy.

3. Favorable letters of recommendation from the director of the institution in which practice was accomplished.

Army — Women only, who qualify physically — civilian employees — ($1620 a year, less deduction of $480 for quarters and rations).

Navy — Men only, who qualify physically, as pharmacist's mates 1st, 2nd, or 3d class or chief pharmacist's mate (acting appointment) in the Naval Reserve, to be determined by the District Commandant.

Chemical Control of Cancer Advanced by Experiments

A step toward the control of cancer by chemical treatment is announced by Dr. Leonell C. Strong, Yale University School of Medicine. (*American Journal of Cancer*, Feb.)

So far the results apply only to mice, but they indicate the possibility of success in chemical treatment of cancer in other species, because they show that the same chemicals can affect cancers, leaving adjacent normal cells untouched, regardless of the genetic origin of the mouse.

Growth of spontaneous cancers in six different strains of mice was slowed, and in some cases the cancers liquefied while in others they disappeared completely, when the two chemicals, methyl salicylate and heptyl aldehyde, were added to the animals' food.

This shows, Dr. Strong explains, that tissue specificity, a fundamental factor in cancer development, will not impede chemical control of the malignant disease if scientists can find a chemical that will check or reverse the malignant process. In other words, even though there is an intrinsic genetic factor which plays a part in predisposing an individual to cancer, the cancer can be controlled by chemical attack. The chemicals probably could not change the genetic factor predisposing to cancer, but by their effect on other fundamental aspects of the cancer, they could check the malignancy.

This work is the logical development of similar work on the use of true oil of Gaultheria and of heptyl aldehyde used alone, which has been reported by Dr. Strong, during the past several years.

Next step toward chemical control of cancer, Dr. Strong says, will be to find a combination of pure chemicals which have the maximum effect on cancers in laboratory animals. After that it may be time to talk about chemical control of human cancers. — *Science News Letter.*

Protection From Flu Virus In Human Nose Secretions

Discovery of a substance in human nasal secretions that has the power of protecting against influenza by inactivating relatively large amounts of influenza virus is announced by Dr. Thomas Francis, Jr., of New York University. (*Science*, Feb. 23.)

While the studies of Dr. Francis, one of America's leading research workers on epidemic influenza, are not yet complete, he considers it highly probable that the phenomenon he has discovered is of considerable importance in relation to individual susceptibility to epidemic influenza.

Dr. Francis began his experiments because the amount of influenza-fighting antibodies in the blood did not always indicate whether the individual would contract or escape influenza. He suspected from this fact, and from rapid and protective repair that took place in the noses of ferrets with influenza, that the human nose and respiratory tract might play a significant role in the prevention of the natural disease.

Over the last 15 months, Dr. Francis has experimented with nasal secretions from 31 patients in the first day or two of acute feverless common colds, two hayfever patients, and 15 well persons. Liquid was centrifuged from such material. For testing, it was mixed with 1,000 lethal doses of influenza virus and given test mice through the nose. The mice were watched to see whether or not they became ill. There was little difference between the results obtained with nasal secretions from patients with common colds and those from normal subjects. Nasal secretions of approximately half caused complete or almost complete inactivation of 1,000 lethal doses of virus, while the other half exerted either slight or no inactivation.

Whether Dr. Francis' discovery will lead eventually to a preventive or curative treatment for influenza will depend upon further research and results. — *Science News Letter.*

BOOK REVIEWS

REPORTS ON MEDICAL PROGRESS 1939 AS PUBLISHED IN THE NEW ENGLAND JOURNAL OF MEDICINE. Compiled and edited by *Robert N. Nye*, M.D. Cloth. Pp. 562. Price $5.00. Boston: Little, Brown & Co., 1940.

In the foreword to this volume the editor points out that during the past year the New England Journal of Medicine has brought weekly progress reports on various subjects covering virtually the entire field of diagnosis, pathology and therapy, both internal and surgical. These articles, each written by prominently identified specialists, are supposed to give comprehensive reviews of recent progress as culled from the literature. No less than 54 contributors are listed, while the contents list 52 articles or rather reviews. Of these undoubtedly an article (not a review of the literature) by Lahey on the surgical treatment of thyroid disease is best, because it presents his painstaking methods in his clinic of reducing the operative mortality to the minimum. Turning to the review on cancer (Taylor) nothing strikingly new is reported and local and general refrigeration as advocated by Smith and Fay is properly still regarded as palliative and in the experimental stage. A chapter of particular interest to us is on physical therapy. This is rather disappointing in the introductory part for the author rehashes the story of the effect of the World War on the development of this discipline. He then reviews fever therapy, radiant light and heat, diathermy and peripheral vascular disease therapy. The entire article is an elementary exposition of these subjects rather than one of recent progress, and therefore of questionable value to physical therapeutists. Surgical diathermy is also discussed in like vein and not free of errors. Thus the author speaks of desiccation and coagulation currents produced by a spark-gap machine, and cutting current produced by a tube or spark-gap machine, when as a matter of fact it is the modulation of the high frequency current as such, irrespective of the kind of apparatus which provides facilities for all methods of electrosurgery and should so have been emphasized. "In 1902, Le Rivière of Paris, treated a patient with a form of high-frequency current. Accidental contact of the patient's hand against an uninsulated wire later disintegrated the wart — thus began the modern treatment of warts and moles by desiccation." There is no Le Rivière in Paris, but there is a Joseph-Alexandre Rivière, who is justly regarded as the first physician to have systematically made use of the high frequency current not only for warts and moles but for malignant neoplasms.

The book contains no illustrations. While reviews of progress in a general medical journal are timely and appropriate, their issue in book form presupposes a desire on the part of the reader to familiarize himself with recent studies of an experimental or clinical nature in all branches of medicine. Such men do not need basic or elementary introductions, and this book could have been made more profitable if some of the contributors had approached their tasks from such a standpoint. The format of the book is excellent and bibliographic references — not always adequate — after each review are valuable hints for collateral reading.

AIDS TO DERMATOLOGY AND VENEREAL DISEASE. By *Robert M. B. Mackenna*, M.A., M.D., B.Ch. (Camb.), M. R. C. P. (Lond.). Hon. Dermatologist, Royal Liverpool United Hospital. Second Edition. XII-o. Cloth. Pp. 284. Price $1.25. Baltimore: The William and Wilkins Co., 1939.

This is a pocket size book intended for students and general practitioners similar in style to the well known quiz-compends that have been in vogue for a number of years. Accordingly it contains the merest essentials, such as are required for the passing of examinations for licensure, and a certain amount of diagnostic and therapeutic hints adequate for every day needs. The text proper is divided into 21 chapters, dealing with the physiology and anatomy of the skin, general therapeutics, nomenclature, malformations, infections and affections of the sebaceous glands and those caused by animal and vegetable parasites. The author discusses tuberculosis and leprosy, dermatitis, urticaria, herpes, pemphigus, pityriasis, psoriasis, pruritus, purpura, tumors, diseases of the hair and nails and venereal diseases. It is evident that the compend is a *multum in parvo*, giving definitions, signs or symptoms, diagnosis and treatment of each affection or condition described as a disease entity. The text is terse and lucid and adequate for the intended purposes.

THE 1939 YEAR BOOK OF GENERAL THERAPEUTICS. Edited by *Bernard Fantus*, M.S., M.D., Professor of Therapeutics, University of Illinois College of Medicine; Director of Therapeutics, Cook County Hospital, etc., and *Leroy Hendrick Sloan*, M.D., F.A.C.P., Professor of Medicine, University of Illinois College of Medicine; Attending Physician, Cook County Hospital, etc. Cloth. Pp. 532 with 72 Illustrations. Price, $2.50. Chicago: The Year Book Publishers, 1939.

The work of Dr. Fantus throughout the many years both as teacher and investigator has been of such a sincere and brilliant character that his name to an article is like the stamp of Sterling to silver. It is timely that we pay homage to this gifted man who has inspired and guided a greater number of the new generation of practitioners toward a more efficient plane of therapeutics than any other living

American. The present or twenty-second volume under Fantus' editorship should have been made into a special number — a sort of Jubilee number — in appreciation of his keen and critical and constructive labors in behalf of rationalized therapy. So far as the 1939 Year Book of General Therapeutics is concerned, it would have been sufficient recommendation under routine circumstances to point to the connection of Fantus' name to gain for it a wide audience. The 1939 edition is, however, extraordinarily laden with therapeutic treasures to warrant special space and praise. One should devote a paragraph of superlatives to its comprehensiveness, for it must be pointed out that it presents new or improved procedures that touch at least 117 disease conditions. No less should be said of its authoritativeness, for it contains the digest of over 2,000 articles out of which 456 were incorporated in this volume. Its timeliness is another factor over which one could spend much space in praise. One will find in this book the latest opinions on the most important and outstanding therapeutic contributions, and these presented with such clarity that the average clinician must regard this volume as a veritable treasure house of practical information. It is a book so authoritative, comprehensive, timely, practical and useful that no progressive physician can afford to be without its instructive guidance. It is the most important "must book" of the year, to be referred to daily or hourly by every conscientious and progressive physician.

THE 1939 YEAR BOOK OF UROLOGY. Edited by *John H. Cunningham*, M.D., Associate in Genito-Urinary Surgery, Harvard University Post-Graduate School of Medicine. Cloth. Pp. 437. Price $2.50. Chicago: The Year Book Publishers, Inc., 1940.

This review of the urologic literature for the year just passed covers a wealth of information in a well edited and organized style. Scrutiny of the many abstracted articles reveals that urologic surgery in America is making rapid strides forward, while the contributions of Continental European authors appear to be reduced both quantitatively and qualitatively — proof of the pernicious effect of political unrest. Of particular interest are several articles which show a tendency to broaden urologic practice so as to correlate this discipline with laboratory investigations and general clinical observations. Thus in renal affections one finds considerable study with relation to such problems as climate, calcium imbalance, water balance, and certain function tests. Anuria has been studied from the standpoint of systemic disease rather than a limited organic disturbance. The same applies to hematuria, for which complete urologic examination is essential. The pathology of urinary infections has been given a further impetus by important research. These are but few of the problems that have been taken up during the preceding year and are carefully recorded in the present volume. Apart from the editor's extensive introduction and a section of 90 pages devoted to general considerations, the text proper deals with renal and adrenal injuries and diseases (83 pages), those of the ureter (18 pages), of the bladder and urachus (62 pages), of the genitalia (53 pages), and gonorrhea (18 pages). A special section is given over to transurethral operations (18 pages) and small sections review some contributions on fever therapy and the therapy with sulfanilamide. There are 154 illustrations of instruments, pathologic processes, x-ray plates and operative technics. The book concludes with two indices. General surgeons as well as urologists will find this volume even more interesting and informative than its predecessors.

THE 1939 YEAR BOOK OF PEDIATRICS. Edited by *Isaac A. Abt*, D.Sc., M.D., Professor of Pediatrics, Northwestern University Medical School, Attending Physician Passavant Hospital, Consulting Physician Children's Memorial Hospital and St. Luke's Hospital, Chicago, with the collaboration of *Arthur F. Abt*, B.S., M.D., Assistant Professor of Pediatrics, Northwestern University Medical School, Associate Attending Pediatrician Michael Reese Hospital, etc. Cloth. Pp. 520. Price, $2.50. Chicago: The Year Book Publishers, Inc., 1940.

The present issue of the year book on pediatrics shows a vast amount of new literary material for the year just passed, all of which has been carefully abstracted and edited. Considering that the contributions to the year's literature pertain to surgical as well as medical subjects there is some unavoidable overlapping with other disciplines. The subjects abstracted range from problems of the new-born, feeding of infants, nutrition and vitamins through diseases of the gastrointestinal tract, infectious diseases, parasites, rheumatism, affections of the heart, blood diseases, tuberculosis, syphilis, respiratory affections, endocrinic disturbances, nervous and mental diseases, dermatologic and genito-urinary affections, allergy, constitutional deficiencies down to scurvy and rickets. Additional sections take up surgical infections and malignancies of the various organs. A brief section on hospitals for children concludes the text proper, which contains 117 well executed illustrations. A subject index and an authors' index conclude the volume. The format of the book is the same as all preceding ones. Physicians who are interested in the diagnosis and management of diseases of children will find much of value in this 1939 review of the specialistic literature.

INTERNATIONAL ABSTRACTS

The Tragedy of Footwear. Edwin A. Lindsay.
Lancet **24**:1211 (Dec. 9) 1939.

In an age when fitness is the watchword of progress, it is a lamentable fact that foot-coverings, instead of keeping pace with this rapid advance, have so far lagged behind that they may seem to be going the other way. In fact, in many ways modern shoes have increased their detrimental effects on the feet they were intended to protect. The most important features of correct footwear are: (1) the shape of the insole; (2) the surface of the insole; and (3) shaping of the upper.

The shape of the insole should roughly follow that of the normal foot. The surface of the insole is probably the greatest difficulty, for it should conform to the sole of the foot, giving support where necessary and relief from pressure at certain prominences. It should be slightly convex from side to side at the tread. It should be elevated behind the metatarsal heads and along the inner aspect of the arch, forming a moderate metatarsal and valgus support. On the other hand, there should be a groove or depression on the outer side to prevent pressure on the cuboid and base of the fifth metatarsal bones. The heel seat is better if cupped to hold that part of the foot firmly in position and not allow side twisting, which happens where it is flat. The shaping of the upper should be designed to fit two unequal halves of the foot and not, as at present, cut as if the foot were the same on each side. This would prevent that aggravating pressure which so often is felt, along the first metatarsal and the inner side of the foot and makes the wearer so glad to remove the shoe.

Electrocoagulation of Hemorrhoids. Samuel Goldfarb.
Med. Record **150**:255 (Oct. 4) 1939.

The buttocks and anal orifice are exposed and the patient placed in Sims' position. It is even not necessary to prepare the operative field as the procedure is self-sterilizing. Internal hemorrhoids are brought into view by ordinary manual eversion of the hemorrhoidal ring, thereby eliminating the use of special specula, which may cause sparking and consequent pain or injury to patient. Each hemorrhoid, whether internal or external, is then injected with five per cent quinine urea hydrochloride solution. According to Goldfarb, in other methods employing electricity the external hemorrhoids cannot be treated simultaneously with the internal as we do here.

A 24-gauge, three-quarter inch hypodermic needle has proved satisfactory since it is not a special expensive size and yet small enough to be practically painless. The needle is inserted directly into the hemorrhoid and sufficient solution injected to distend the "pile." This usually requires from one to two cc. for each average sized hemorrhoid. The anesthetic takes effect in five to ten minutes, at which time the area is sufficiently anesthetized to permit coagulation.

The d'Arsonval current of from 500 to 1500 milliamperes is used, the average case requiring approximately 750 milliamperes. The points of a biactive (biphasic) electrode are inserted into the hemorrhoid, the circuit closed by means of a footswitch, and an area of approximately one-quarter inch in diameter is coagulated. The area being coagulated should be closely observed and the current turned off when the tissue becomes blanched, light yellow in color, and of the desired diameter. The electrode is then inserted into the adjoining tissue, which is also coagulated, and so on until the entire hemorrhoid has been blanched. All other hemorrhoids are similarly treated at the same time. The entire coagulated mass is left intact, a dry dressing may be applied, and the patient leaves the office, ambulatory, with instructions to take an ounce of mineral oil the night of the following day, and continue for several nights. If any discomfort follows the coagulation, hot sitz baths will afford relief.

Artificial Sunlight for Miners.
Foreign Letters, Stockholm, J. A. M. A. **113**: 1653 (Oct. 28) 1939.

A solarium has been provided by the proprietors of the Boliden mine, whose underground workers can enjoy daylight only on Sundays and for a short daily meal interval from the middle of September to the middle of March. Dr. Johan Ponten, who has played an important part in connection with this solarium, has recently issued a report on its action since it was started in December 1937. The room in which four large quartz lamps and four "sollux" lamps were installed measured 25 to 30 C. (77 to 86 F.). After changing their clothing and taking a douche or bath, the men would sit naked in the solarium for three minutes every other day, their eyes protected by special glasses.

Wishing to obtain objective and reliable data concerning the effects of such infra-red and ultraviolet radiation on the miners, Dr. Ponten carried out calcium and phosphorus analyses of the blood on twenty-two healthy miners between the ages of 23 and 47. He found an appreciable rise in the average calcium content of the serum from 9.9 mg. per hundred cubic centimeters before the solarium was opened to 10.5 mg. in March 1938, after the solarium had been in use for three months. Another line of research was to compare the morbidity rates among the workers in the Boliden mine before and after the provision

of the solarium. Among the 175 underground workers, the sickness rate was 9.7 days per head in 1937 and 8.5 in 1938. In the same period there was a reduction by 12 per cent in the frequency of "one day diseases" and a reduction by 43 per cent of the catarrhal diseases of the respiratory tract. A questionnaire to which anonymous answers were invited showed that a large proportion of the men considered themselves fitter in many respects since they had enjoyed the benefits of the solarium.

The Use of Irradiated Evaporated Milk in Infant Feeding. Richard W. B. Ellis.

Arch. Dis. Childhood **14**:295 (Dec.) 1939.

Although the incidence of rickets in England has been greatly reduced in recent years, mild cases are still seen too frequently even amongst infants attending infant welfare centres. This may be due either to the mother's failure to give the additional vitamin D that has been prescribed, or to insufficient amounts of vitamin D having been prescribed. If therefore any form of "fortified" vitamin D milk were available at an economic price which could safely be relied on to prevent infantile rickets in artificially fed babies and could be given over long periods without ill effect, it would clearly have a valuable place in infant feeding. Ellis only irradiated evaporated milk in relation to the prophylaxis and cure of infantile rickets.

Twenty normal full-term infants were given irradiated evaporated milk as their sole source of oral vitamin D during three to six months between October and April. At the end of three months one infant showed radiological evidence of mild active rickets and two of healed rickets. Seven infants suffering from active rickets were treated as inpatients with irradiated evaporated milk as their sole source of vitamin D. Evidence of healing was seen in all cases in from one to three weeks. The author concludes that although the brand of irradiated evaporated milk used will serve to protect the majority of full-term infants from manifest rickets, it cannot be relied on to do so in all cases. That the milk in question has considerable anti-rachitic properties is shown by the response of the rachitic group of infants. It should therefore serve as a valuable source of vitamin D, particularly in the case of infants who receive vitamin D supplement irregularly or in insufficient amount. The milk should not, however, be relied on as the sole source of vitamin D, particularly in the case of prematures. The milk was found easy to use, and was taken well by the majority of infants. No ill effects were observed from its prolonged administration.

The Blocking and Deblocking Effects of Alternating Currents on Nerve. A. Rosenblueth and J. Reboul.

Am. J. Physiol. **125**:251 (Feb. 1) 1939.

The effects on nerve conduction of applications of the alternating current to motor nerves were studied in cats. The indicators of nerve conduction used were either the mechanical responses of the gastrocnemius soleus muscle or the spike-potentials of the A fibers of the peroneal nerve. Nerve impulses may be blocked after the application of the current. The block is a function of intensity, frequency, duration and interelectrodal distance. Repeated applications of the current lead to increasing blocks. Block may be demonstrated during the passage of the current, or it may be delayed. The alternating current has a deblocking action which can be demonstrated after some fibers have been blocked. This action is an independent process, not a subsidence of the previous block. Applications of the current lead to the appearance of both the blocking and deblocking processes. The two are independent and therefore coexist. Their time course of subsidence is different. The presence or absence of conduction in the fibers of a nerve treated by the alternating current depends on the resultant of the two opposite effects.

Thyroid Stimulation by Cold. G. C. Ring.

Am. J. Physiol. **125**:244 (Feb. 1) 1939.

Elevation in the basal metabolism of rats which follows short periods of exposure to cold is associated with a rise in body temperature. The value of Arrhenius, determined at normal body temperatures of rats, is about 21,000. It is not affected by thyroidectomy. Living for 3 weeks or more at 0 to 5 C. produced in rats an average elevation in metabolism of 21 per cent. Corrected for changes in body temperature this figure becomes 16 per cent. This increased metabolism is brought about largely if not entirely by the thyroid gland. Nervous pathways through the superior cervical ganglia are not essential for bringing about stimulation of the thyroid gland by cold.

Convulsions in Childhood. A Review of One Thousand Cases. M. G. Peterman.

J. A. M. A. **113**:194 (July 15) 1939.

The immediate treatment of convulsions presents an acute problem. If there is associated high fever, cold packs or cool sponges should be used. A cool hypertonic saline enema may also be given. Magnesium sulfate may be used in 25 or 50 per cent solution. If this is not available, sodium chloride or sugar may be used in the same percentage. These procedures are safe and will keep the mother occupied until further assistance is provided. Probably more harm has been done with hot baths or hot packs than with neglect. When facilities permit, a spinal puncture should always be done. Whether the fluid is under pressure or not, the drainage will be of therapeutic value and the examination of the fluid will be of great assistance in making the diagnosis. The most effective, practical and rapid treatment of any convulsion, particularly of continuous convulsions, is the prompt administration of chloroform by inhalation. A vial of fresh chloroform should always be available to every physician called on to treat convulsions. While there is an

element of danger in its use, the possibilities of harm are not nearly as great as is the injury to the brain resulting from a continuation of the convulsion. Morphine or opium or even chloral may be more dangerous than chloroform if they are improperly used. Opium derivatives should never be used to treat convulsions. They mask symptoms, depress the respiratory center and diminish or stop peristalsis.

Photosensitizing Agents. I. Lewis Sandler.

J. A. M. A. **112**:2411 (June 10) 1939.

Sandler reports two cases of pigmentation — one resulting from a photosentizing dye and the other from a toilet water — and discusses the parenteral and ingested photosentizing substances as well as the topical photosensitizers. Pigmentation of the skin may follow the topical application of a number of photosensitizers, e.g. eosin and eosin compounds, oil of bergamot, oil of lavender, oil of cedar, vanillin oil, perfume, eau de colgne, mercury bichloride, dyes and Dictamnus albus (gas plant). Substances such as sulfanilamide, gold, silver, hematoporphyrin, acriflavine, eosin, rose bengal, erythrosin (fluorescein) and chlorophyll, when injected into the body, possess the property of sensitizing the skin to light. Photosensitization in animals has been associated with the eating of buckwheat, clover and sudan grass. Patients under such medication or in contact with such agencies must be especially watched when treated or exposed to sunlight or artificial ultraviolet radiation.

Vitamin-Resistant Rickets. A. Morton Gill.

Arch. Dis. Childhood **14**:50 (March) 1939.

It is difficult to understand the mechanism of vitamin-resistant rickets because they are cases of true rickets. In nuritional rickets and in those due to lack of sunlight, the response to therapy is invariably rapid and striking. In celiac disease the etiology of the rickets is fairly well understood and ultraviolet light alone causes healing. The cases observed by the author showed no healing after such therapy. In cases of vitamin-resistant rickets not only is renal function normal, but the figures for blood calcium and phosphorus remain within normal limits. The blood phosphates, on the other hand, are invariably high, as it always is in active rickets, giving some indication of the activity of the rachitic process.

Albright and his co-workers investigated the possibility of calcium drain, due to hyperparathyroidism, with negative results. The normal blood calcium and calcium balance in these cases is sufficient to rule out a primary hyperparathyroid defect. A possible biochemical factor has been suggested by Hamilton and Dewar (1937) in that they found that the addition of sodium salts of citric or tartaric acid prevented the development of rickets in rats when added to a rachitogenic diet. Since vitamin-resistant rickets is evidently not due to nutritional disturbance, lack of sunshine, hyperparathyroidism, faulty absorption or renal impairment, and since the condition heals spontaneously when growth ceases, the fault may perhaps be a failure of utilization at the site of bone growth.

Changes in the Prostate Caused by High Frequency Current. Leo A. Maslow, and Eugen Martos.

Arch. Path. **28**:371 (Sept.) 1939.

Tissue particles obtained by transurethral prostatic resection show considerable distortion. The changes consist of three layers of different structure; a charred thin superficial layer, a spongy coagulative layer of varying width and a wider layer which becomes homogeneous in varying degrees. The alveolar epithelium becomes much elongated, threadlike and packed in close bundles. Knowledge of the nuclear elongation is important because it may lead to diagnostic mistakes. The authors were able to produce similar but smaller changes in cadaver prostates five to six days after death. The degree of the changes produced seems to be independent of the strength of the current but seems to be dependent on the moisture content of the tissue.

Definition of the Finsen Unit Is Required. Jean Saidman.

Ann. Inst. d'actinol. **13**:1 (Oct.) 1938.

Saidman believes that the biologic unit which is the most important in therapy is that which concerns ultraviolet B: the monochromatic investigations agree in localizing the maximum of erythematogenous power around 2,967 angstroms for mercury and cadmium lamps, and rather close to this wavelength for the sun and the arc lamps. The sensitivity curves established by various authors are in agreement. The definition of the Finsen unit proposed by Coblentz and accepted by the Council on Physical therapy of the American Medical Association should be adopted by the French actinologists, provided it be made to apply only to ultraviolet B, because the variations are too wide in ultraviolet C, the reactions of which are not very intense, and in ultraviolet A above 3,200 angstroms, in which the reactions occur only during intense exposures.

Temperature Factors in Cancer and Embryonal Cell Growth. Lawrence W. Smith, and Temple Fay.

J. A. M. A. **113**:652 (Aug. 19) 1939.

New light is thrown on the physiologic changes of cancer growth to refrigeration by Smith and Fay. Their investigations indicate that there is a relationship between sites of cancer growths and temperature of certain bodily regions. They point out that relatively low body surface temperatures normally exist in the segments concerned with the extremities (from 88 to 90 F.) as compared with breast segment (fifth thoracic) which tends to maintain a higher surface temperature than

the adjacent segments of the trunk. They showed that there is relative infrequency of primary or metastatic carcinoma developing in those parts of the body associated with reduced temperatures, as compared to the organs and portions of the body where optimal high temperatures are found. Certain clinical, pathologic and biologic evidence indicates that young, undifferentiated cell growth and activity require an optimal temperature and that "critical" temperature levels exist below which these cells become inactive or undergo degenerative changes.

Local and general measures of "refrigeration" applied to patients suffering from hopeless metastatic carcinoma were shown to influence cell growth and activity. This was demonstrated by serial biopsy and tissue cultures. A "critical" level of around 95 F. was noted, below which undifferentiated cell growth, as exemplified by carcinoma pathologically and by the development of chick embryos, were arrested. Marked degenerative changes were observed after seventy-two hours in biopsy specimens from carcinomatous tissues, when continuously subjected to temperatures of 90 F. or below. The authors showed that normal cellular tissue is capable of withstanding 40 F. for prolonged periods of time without evidence of degenerative changes, and normal reparative processes in carcinomatous areas maintained at this level. Tissue culture studies have confirmed these clinical observations.

Relief of pain encountered in terminal states of metastatic carcinoma has promptly followed "refrigeration" of the area involved or induced states of "hibernation" in which the patient has been maintained at levels of rectal temperature between 81 and 90 F. for periods as long as from one to five days. These observations suggest that the application of subcritical temperatures, through methods of local and general "refrigeration," may offer a valuable therapeutic adjunct to present methods of treatment of undifferentiated cell growth, particularly of carcinoma. Its practical clinical value and possibilities must await wider experience and more extensive and intensive observations.

Low Back Pain With Sciatic Radiation. Robert E. Hastings.

Southwestern Med. **23**:183 (June) 1939.

After a thorough examination of both the patient and the x-rays, the program treatment is outlined. The author's treatment consists of having the patient wear a snug short lumbosacral body cast in order to straighten out the lordosis and bring the sacrum forward. This is usually followed by about 7-10 days of complete bed rest. A hard bed is best, with the knees supported in flexion. A hospital bed is ideal. The cast is left on for two weeks, during which time exercises are given to develop the abdominal muscles and straighten the sacral angulation. Hip stretching exercises are also advised. All patients are cautioned never to do anything which will increase their lordosis. When car riding is allowed, they are advised to have the seat well forward so that the thighs are flexed and the spine straightened. Any lifting is done with the spine held straight and the legs are used to lift with as they are extended. After the cast is removed, most patients are fitted with a lumbosacral support. The same program, omitting the use of the body cast, is advised when backache alone is the complaint. The decrease of lordosis is the principal key to relief.

Ultraviolet Irradiation in Skin Diseases. Austin Furniss.

Brit. J. Phys. Med. **2**:280 (Dec.) 1939.

In seborrhoea it is advisable to give the scalp a spirit shampoo before irradiation. Long hair will require thorough combing during irradiation to ensure exposure of the scalp. Sulphur ointment may be applied between exposures. Seborrhoeic dermatitis and infiltrated patches may require more severe reactions — second to third degree erythema — if plaques are associated with the popular dermatitis.

Herpes in its various forms responds well to ultraviolet irradiation. Relief is afforded not only from the severity of the eruption but from the accompanying pain. In fact, if seen early enough, little or no pain is experienced after the first treatment. Vigorous local irradiation (second degree erythema doses) not only stop the immediate discomfort but prevent scarring. After each irradiation collodion may be employed with advantage as a dressing. Post-herpetic neuralgia is not a usual sequel in cases treated by actinotherapy. This painful condition has been successfully treated by luminous heat irradiation with the Sollux lamp.

Dermatitis venenata responds satisfactorily to ultraviolet irradiation. After one or two doses the stinging is dispelled and spreading is usually prevented. Treatment is given every other day, using the air-cooled lamp, a second degree erythema being produced. Other examples of this condition respond well to ultraviolet light.

The effects of actinotherapy in erysipelas are specific. A critical fall in temperature sets in within 24 to 48 hours, and the condition clears up quickly. Relapses are rare, and clear up equally readily on subsequent irradiation.

Any greasy ointment is removed. Using the Kromayer lamp at 2 inches distance, the whole or the affected area, including 1½ inches of healthy skin at the margins, is irradiated to produce a heavy third degree reaction. Only the eyeballs need protection in head cases. The Kromayer lamp is undoubtedly best for small areas. For larger areas, the mercury-vapour lamp should be used, covering the healthy skin almost to the margins of the area. One treatment usually suffices, unless part of the area has been underirradiated. The area should be left uncovered after the irradiation.